TO 1F-15A-1

FLIGHT MANUAL

USAF SERIES
F-15A/B/C/D AIRCRAFT
BLOCK 7 AND UP

McDonnell Aircraft

F33657-70-C-0300

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INTRODUCING THE F-15

SCOPE. This manual contains the necessary information for safe and efficient operation of your aircraft. These instructions provide you with a general knowledge of the aircraft and its characteristics and specific normal and emergency operating procedures. Your experience is recognized; therefore, basic flight principles are avoided. This manual provides the best possible operating instructions under most circumstances. Multiple emergencies, adverse weather, terrain, etc. may require modification of the procedures.

PERMISSIBLE OPERATIONS. The flight manual takes a positive approach, and normally states only what you can do. Unusual operations or configurations are prohibited unless specifically covered herein. Clearance must be obtained before any questionable operation, which is not specifically permitted in this manual, is attempted.

HOW TO BE ASSURED OF HAVING LATEST DATA. Refer to TO 0-1-1-4 for a listing of all current flight manuals, safety supplements, operational supplements, and checklists. Also, check the flight manual cover page, the title block of each safety and operational supplement, and all status pages contained in the flight manual or attached to formal safety and operational supplements. Clear up all discrepancies before flight.

ARRANGEMENT. The manual is divided into seven fairly independent sections to simplify reading it straight through or using it as a reference manual.

SAFETY SUPPLEMENTS. Information involving safety will be promptly forwarded to you in a safety supplement. Supplements covering loss of life will get to you within 48 hours by teletype, and supplements covering serious damage to equipment within 10 days by mail. The cover page of the flight manual and the title block of each safety supplement should be checked to determine the effect they may have on existing supplements.

OPERATIONAL SUPPLEMENTS. Information involving changes to operating procedures will be forwarded to you by operational supplements. The procedure for handling operational supplements is the same as for safety supplements.

CHECKLISTS. The flight manual contains itemized procedures with necessary amplifications. The checklist contains itemized procedures without the amplification. Primary line items in the flight manual and checklist are identical. If a formal safety or operational supplement affects your checklist, the affected checklist page will be attached to the supplement. Cut it out and insert it over the affected page but never discard the checklist page in case the supplement is rescinded and the page is needed.

HOW TO GET PERSONAL COPIES. Each flight crewmember is entitled to personal copies of the flight manual, safety supplements, operational supplements, and checklists. The required quantities should be ordered before you need them to assure their prompt receipt. Check with your publication distribution officer - it is his job to fulfill your TO requests. Basically, you must order the required quantities on the appropriate Numerical Index and Requirement Table (NIRT). TO 00-5-1 and TO 00-5-2 give detailed information for properly ordering these publications. Make sure a system is established at your base to deliver these publications to the flight crews immediately upon receipt.

FLIGHT MANUAL BINDERS. Looseleaf binders and sectionalized tabs are available for use with your manual. They are obtained through local purchase procedures and are listed in the Federal Supply Schedule (FSC Group 75, Office Supplies, Part 1). Check with your supply personnel for assistance in procuring these items.

CHANGE SYMBOL. The change symbol, as illustrated by the black line in the margin of this paragraph, indicates text and tabular illustration changes made to the current issue. Changes to illustrations (except tabular and performance data in appendix A) are indicated by a changed area box located at the upper right side of the illustration. The box is divided into eight equal parts which represent eight proportional areas of the illustration. The shaded area of the box represents the area of the illustration which contains a change. An unshaded box indicates no change. The word "NEW" will appear in the box for new illustrations.

NOTE

> Throughout the manual, retrofit (TCTO) effectivities are presented in abbreviated form. Refer to the Technical Order Summary at the front of the manual for detailed production/retrofit effectivites.

WARNINGS, CAUTIONS, AND NOTES. The following definitions apply to Warnings, Cautions, and Notes found throughout the manual.

WARNING

> Operating procedures, techniques, etc., which will result in personal injury or loss of life if not carefully followed.

CAUTION

> Operating procedures, techniques, etc., which will result in damage to equipment if not carefully followed.

NOTE

> An operating procedure, technique, etc., which is considered essential to emphasize.

SHALL, SHOULD, MAY, AND WILL. The following definitions apply to Shall, Will, May and Should found throughout the manual. The word "shall" is used to express a mandatory requirement. The word "should" is used to express nonmandatory provisions. The word "may" is used to express permissiveness. The word "will" is used only to indicate futurity.

YOUR RESPONSIBILITY - TO LET US KNOW. Review conferences with operating personnel and a constant review of accident and flight test reports assure inclusion of the latest data in the manual. In this regard, it is essential that you do your part. Comments, corrections, and questions regarding this manual or any phase of the Flight Manual program are welcomed. Corrections shall be submitted on AFTO Form 847 and forwarded through your Command Headquarters to Warner Robins Air Logistics Center, Robins AFB, GA, 31098-5609, ATTN: MMEDF.

TECHNICAL ORDER SUMMARY

The Technical Order Summary lists only those technical orders which affect this manual.

Technical Order	ECP	Title	Production Effectivity	Retrofit Effectivity
1F-15-641	1227	Inspection and repair of pod support fitting	(A) none (B) none (C) 79-0027 and up (D) 79-0005 and up	(A) all (B) all (C) 78-0468 thru 79-0026 (D) 78-0561 thru 79-0004
1F-15-655	1142	Adds overload warning system	(A) none (B) none (C) 80-0033 and up (D) 80-0056 and up	(A) all (B) all (C) 78-0468 thru 80-0032 (D) 78-0561 thru 80-0055
1F-15-704	1334	Adds interim HAVE QUICK	(A) none (B) none (C) none (D) none	(A) selected aircraft (B) selected aircraft (C) selected aircraft (D) selected aircraft
1F-15-753	1329	Improved fuel transfer system	(A) none (B) none (C) all (D) all	(A) all (B) all (C) none (D) none
1F-15-763	1412	Improved braking system	(A) none (B) none (C) 80-0002, 80-0039 and up (D) 80-0058 and up	(A) all (B) all (C) 78-0468 thru 79-0081, 80-0003 thru 80-0038 (D) 78-0561 thru 80-0057
1F-15-764	1408	Inhibition of emergency generator ground operation	(A) none (B) none (C) 80-0029 and up (D) 80-0056 and up	(A) all (B) all (C) 78-0468 thru 80-0028 (D) 78-0561 thru 80-0055

TECHNICAL ORDER SUMMARY

The Technical Order Summary lists only those technical orders which affect this manual. (Continued)

Technical Order	ECP	Title	Production Effectivity	Retrofit Effectivity
1F-15-771	1345	Adds modified IFF transponder for mode 4 caution light operation	(A) none (B) none (C) 81-0020 and up (D) 81-0061 and up	(A) all (B) all (C) 78-0468 thru 80-0053 (D) 78-0561 thru 80-0061
1F-15-785	807	Replaces RT-1145A/ARC-164 (UHF 1) with RT-1145B/ARC-164 (no HAVE QUICK). Replaces RT-1145A/ARC-164 (UHF 2) with RT-1145C/ARC-164 (HAVE QUICK capability)	none	(A) 77-0061 thru 77-0153 (B) 77-0154 thru 77-0168 (C) 80-0002 and up (D) 80-0054 and up
1F-15-791	1460	Landing gear control and indication circuit improvements	(A) none (B) none (C) 81-0020 and up (D) 81-0061 and up	(A) all (B) all (C) 78-0468 thru 80-0053 (D) 78-0561 thru 80-0061
1F-15-806		Installs modified RT-1145A/ARC-164 radio for HAVE QUICK capability	none	(A) none (B) none (C) 80-0002 and up (D) 80-0054 and up
1F-15-817	1046R1	Adds videotape recording system	(A) none (B) none (C) 79-0015 and up (D) 79-0004 and up	(A) all (B) all (C) 78-0468 thru 78-0550 (D) 78-0561 thru 78-0574
1F-15-831	1496	Adds finger lift stops to prevent inadvertent JFS engagement	(C) 82-0035 and up (D) 83-0046 and up	(A and B) all (C) 78-0468 thru 82-0034 (D) 78-0561 thru 82-0048

TECHNICAL ORDER SUMMARY

The Technical Order Summary lists only those technical orders which affect this manual. (Continued)

Technical Order	ECP	Title	Production Effectivity	Retrofit Effectivity
1F-15-857	1289-R1	Modifies or replaces UHF radio, Adds new ICCP, Adds or modifies MCCP, Adds additional voice warning, Adds KY-58 provisions and KY-28 control panel, Adds HAVE QUICK capability	(A and B) none (C) 80-0002 and up (D) 80-0054 and up	(A and B) all (C) 78-0468 thru 79-0081 (D) 78-0561 thru 79-0014
		Replaces tacan and modifies BIT panel	(A) 77-0061 and up (B) 77-0154 and up (C and D) all	(A) 73-085 and up (B) 73-108 thru 76-0142 (C and D) none
1F-15-881	1758	PTC Interlock defeat	(A) none (B) none (C) 84-0001 and up (D) 84-0042 and up	(A) none (B) none (C) 78-0468 thru 83-0043 (D) 78-0561 thru 83-0050
	253M4	Provides approximately 200 pounds additional fuel in tank 1	74-081 and up	
	604	Modifies AERO-3B launcher to LAU-114/A	(A) 76-0047 and up (B) 76-0136 and up (C) all (D) all	
	648-M6	Canopy control system operational improvements	(B) 76-0133 and up (D) all	
	751	Modifies UHF radio	(A) 77-0061 and up (B) 77-0154 and up (C) all (D) all	
1F-15-923	1795	AN/ALE-45 Countermeasures Dispenser (CMD)		(C) 76-0468 thru 83-0028 (D) 78-0561 thru 83-0047

TECHNICAL ORDER SUMMARY

The Technical Order Summary lists only those technical orders which affect this manual. (Continued)

Technical Order	ECP	Title	Production Effectivity	Retrofit Effectivity
	909	Relocates boarding steps lower release button	(A) 76-0076 and up (B) 76-0135 and up (C) all (D) all	
	957	Adds rapid alignment capability	(A) none (B) none (C) 79-0049 and up (D) 79-0010 and up	By attrition
	1119	Adds KY-58 modified MCCP, new ICCP, HAVE QUICK capability, and additional voice warning	(A) none (B) none (C) 80-002 and up (D) 80-0054 and up	none
	1159-M9	Adds EWWS enable switch	(A) none (B) none (C) 78-0052 and up (D) 78-0570 and up	none
	1377R1S4	Provides conformal fuel tanks	none	(A) none (B) none (C) selected aircraft (D) selected aircraft
	1398-MO	Provides release of survival kit connectors when restraint emergency release handle is actuated with ejection seat in aircraft	(A) none (B) none (C) 79-0067 and up (D) 80-0054 and up	none
	1416	Removes range markings from FTIT indicator	(A) none (B) none (C) 80-0029 and up (D) 80-0056 and up	none

TECHNICAL ORDER SUMMARY

The Technical Order Summary lists only those technical orders which affect this manual. (Continued)

Technical Order	ECP	Title	Production Effectivity	Retrofit Effectivity
	1584-M2	Modifies RWR control panel	(A) none (B) none (C) none (D) none	(A) none (B) none (C) 83-0028 and up (D) 83-0048 and up
	1584R1	Adds provisions for AN/ALE-45 Countermeasures Dispenser Set	(A) none (B) none (C) none (D) none	(A) none (B) none (C) 83-0028 and up (D) 83-0048 and up
	1600	Incorporates Multi-Staged Improvement Program (MSIP)	(A) none (B) none (C) none (D) none	(A) none (B) none (C) 84-0001 and up (D) 84-0042 and up
	1716-0	Provides electrical power to the engine tachometers under all modes of emergency generator operation	(A) none (B) none (C) none (D) none	(A) none (B) none (C) 83-0035 and up (D) 83-0049 and up
	1775	Incorporates F100-PW-220 engines	(C) 85-0095 and up (D) 85-0130 and up	

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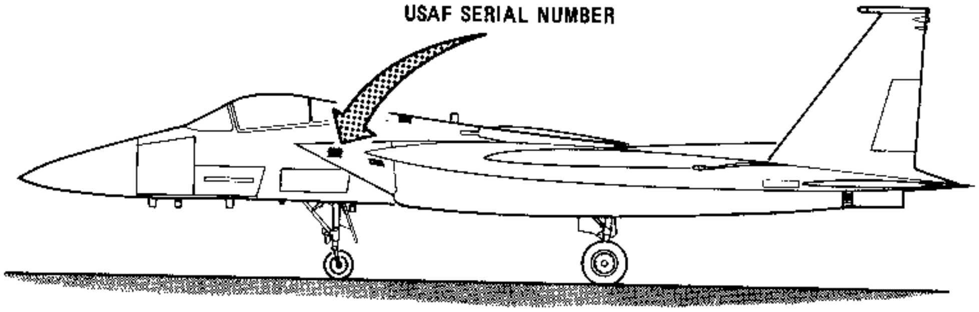

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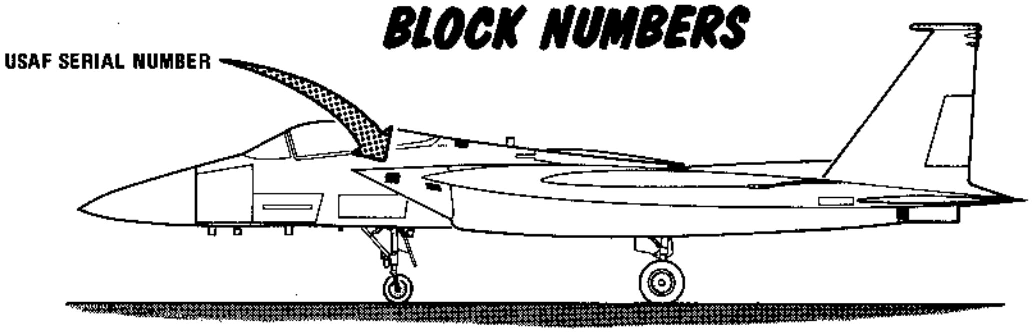

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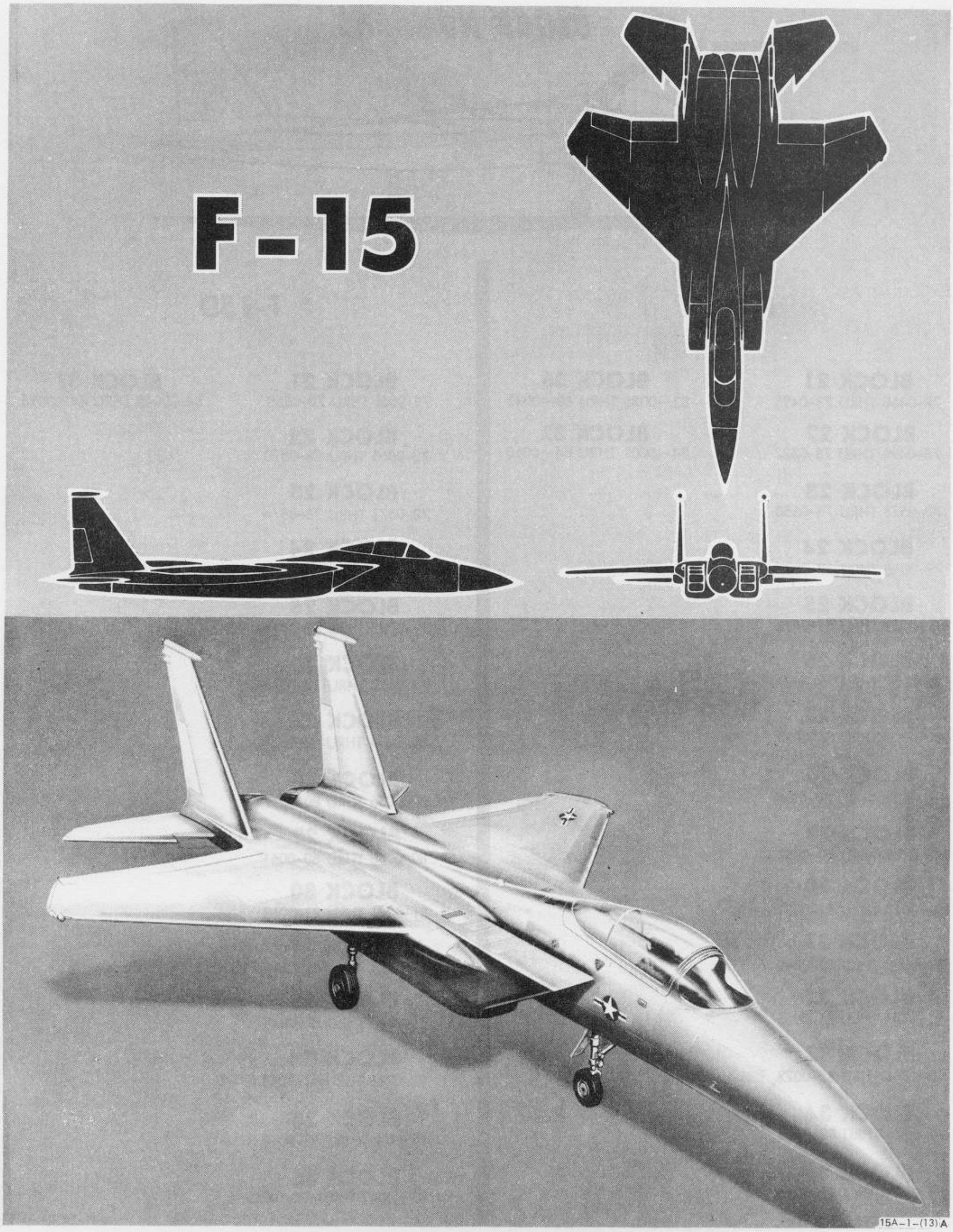

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AIRCRAFT

The F-15 is a high-performance, supersonic, all-weather air-superiority fighter built by McDonnell Aircraft Company. Its primary mission is aerial combat, but it can also perform ground attack missions. Radar and heat seeking air-to-air missiles and a 20 MM gun are the primary armament. The aircraft is powered by two Pratt and Whitney F-100 turbofan engines. Aircraft appearance is characterized by a high-mounted swept-back wing, twin vertical stabilizers, and a light, high strength structure containing rugged subsystems. The cockpit is elevated to enhance visibility. The major aircraft systems are designed and located for high maintainability and reliability. An airframe mounted accessory drive (AMAD) contains many accessories. A jet fuel starter (JFS) provides self-starting of the engines. System design precludes the requirement for batteries. Refer to foldout section for general arrangement illustration.

DIMENSIONS

The approximate overall dimensions of the aircraft are:

Span - 42 feet, 10 inches
Length - 63 feet, 9 inches
Height -
    top of vertical tail - 18 feet, 8 inches
    top of closed canopy - 12 feet
Distance between main landing gear - 9 feet

GROSS WEIGHT

The following gross weights are approximate to the nearest 500 pounds and shall not be used for computing aircraft performance or for any type operation.

F-15A/B -

Operating weight (basic weight plus pilot, oil, and unusable fuel)	27,500 pounds
Takeoff gross weight (operating weight plus full internal fuel, full centerline fuel tank, wing pylons and 4 LAU-114 missile racks)	45,000 pounds
Takeoff gross weight as above plus 2 full external wing fuel tanks	54,000 pounds

F-15C/D -

W/O CFTs pounds	Configuration	With CFTs pounds
29,000	Operating weight (basic weight plus pilot, oil and unusable fuel)	31,000
48,500	Takeoff gross weight (operating weight plus full internal fuel, full centerline fuel tank, wing pylons and 4 LAU-114 missile racks)	60,500
57,000	Takeoff gross weight as above plus 2 full external wing fuel tanks.	68,000

ENGINES

The aircraft is powered by either two F100-PW-100 or two F100-PW-220 turbofan engines with afterburners.

The F100-PW-100 engine is controlled by a hydromechanical control with a supervisory engine electronic control (EEC). The EEC requires engine maintenance trimming to maintain performance as the engine deteriorates.

The F100-PW-220 engine is controlled by a full authority digital electronic engine control (DEEC). The DEEC automatically trims to maintain performance as the engine deteriorates. The F100-PW-220 incorporates improvements which provide improved hot section durability/reliability and more responsive/reliable afterburner operation. The most visible difference between the two engines is the F100-PW-220 inlet pressure probe. Refer to figure 1-1.

A self contained jet fuel starter is used to crank the engines for starting. External power is not required during engine start.

ENGINE AIR INDUCTION SYSTEM

The two independent air induction systems consist of three variable ramps, a variable diffuser ramp, and a variable bypass door. Refer to figure 1-1.

Variable Ramps

The variable ramps provide air, at optimum subsonic flow, to the face of the engine fan inlet throughout a wide range of aircraft speeds. Ramp position is controlled by the air inlet controller.

Bypass Door

The bypass door automatically relieves excess pressure in the inlet duct. The air inlet controller positions the bypass door.

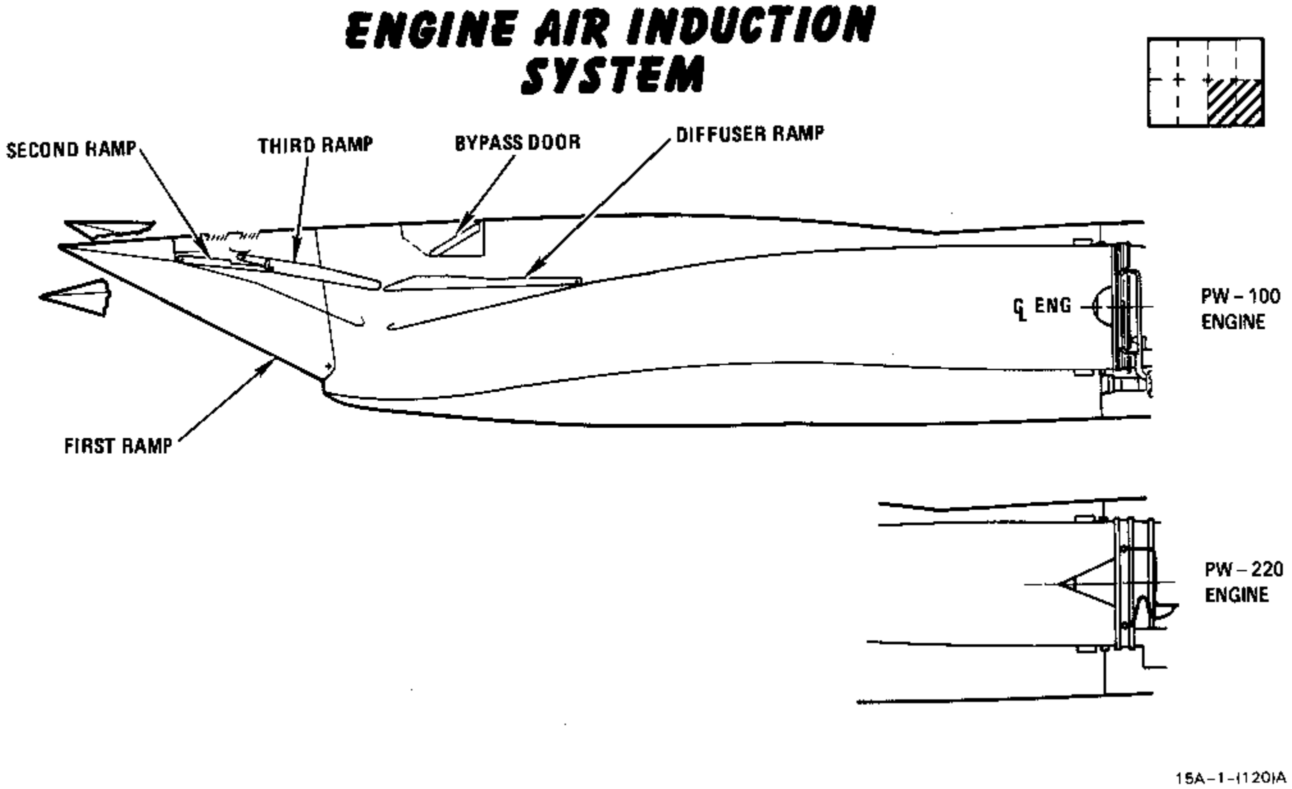
Air Inlet Controller

An air inlet controller (AIC), one for each inlet, uses angle of attack, aircraft Mach number and other air data system outputs to automatically schedule the ramps and bypass door throughout the aircraft envelope. The first ramp is locked in the up position until the engine is started.

Inlet Ramp Switch

An inlet ramp switch for each inlet is on the miscellaneous control panel. The switch is lever locked, and has positions of AUTO and EMERG.

AUTO	The AIC automatically controls the air inlet system. This is the normal position.
EMERG	Removes electrical power from the ramp and bypass door actuators, causing them to move hydraulically to the emergency (ramps locked up and bypass door closed) positions. If hydraulic pressure fails, airloads will force the ramps and bypass door to the emergency position.



ENGINE AIR INDUCTION SYSTEM

Figure 1-1

ENGINE OIL SYSTEM

Each engine is equipped with a completely self-contained oil system. Oil is supplied to the main pump element by gravity feed. Refer to Servicing Diagram, this section, for oil specifications.

ENGINE FUEL SYSTEM

Refer to foldout section for airplane and engine fuel system illustration.

ENGINE CONTROL SYSTEM

The F100-PW-100 engine control consists primarily of a hydromechanical unified control (UC) for main engine and afterburner operation with a supervisory engine electronic control (EEC). The F100-PW-220 engine control consists primarily of a hydromechanical main fuel control (MFC), afterburner fuel control (AFC) and a full authority digital electronic engine control (DEEC).

Unified Control (F100-PW-100)

The unified control (UC) performs the following functions: provides engine speed control, schedules rear compressor variable vanes, initiates engine and afterburner fuel flow, controls the exhaust nozzles, and provides a positive fuel cutoff at engine shutdown. The unified control is scheduled mechanically from IDLE to MIL but is scheduled by the engine electronic control at MIL and above.

Engine Electronic Control (F100-PW-100)

The engine electronic control (EEC) contains operating schedules for the variable fan inlet vanes. During operation at and above MIL power the EEC regulates engine fuel to control FTIT and provides supervisory trimming of the UC to maintain engine operation at maximum safe power. The EEC senses engine and aircraft parameters, compares these values to its operating schedule and, if required, trims the UC to maintain optimum engine operation. The EEC increases idle rpm from normal idle at 0.8 Mach to military power at 1.4 Mach. To reduce thrust below military, the pilot must slow the airplane below Mach 1.4. If the EEC senses a faulty input, it will revert to a degraded mode of operation. The EEC will remain in the degraded mode and the engine may not operate normally until the EEC switch is cycled. The EEC will then resume normal operation if the original fault no longer exists. The L and R EEC lights indicate an EEC failure and the EEC is automatically turned off and cannot be reset if an engine overspeed occurs.

Digital Electronic Engine Control (F100-PW-220)

The digital electronic engine control (DEEC) contains the engine operating schedules for automatic control from IDLE to MAX A/B, and is powered by the engine alternator. The DEEC schedules engine and afterburner fuel flows, compressor inlet variable vanes (CIVV), rear compressor variable vanes (RCVV), start bleed position, anti-ice and nozzle position. The DEEC controls engine performance by scheduling engine fuel flow to control airflow and nozzle position to control engine pressure ratio (EPR). EPR is the ratio between engine exhaust pressure and engine inlet pressure. By controlling airflow and EPR the engine performance is maintained consistent for a new or deteriorated engine until the FTIT limit is reached. If the DEEC detects a failure that prevents it from safely controlling the engine it will automatically switch to the secondary mode, the same as ENG CONTR switch OFF. In this mode afterburner operation is inhibited, rpm is limited to about 80%, the CIVV are in the fully closed position, the nozzle is closed to the minimum area (less than 5%) and the ENG CONTR light is on. The RCVV, start bleeds and engine fuel flow are scheduled by the MFC. The engine will remain in this mode until the failure clears and the ENG CONTR switch is cycled. The engine can be started with the ENG CONTR switch ON or OFF, however, the starting time will be longer in OFF.

Main Fuel Control (F100-PW-220)

The main fuel control (MFC) houses the hydromechanical components that are controlled by the DEEC in the ENG CONTR ON mode. If the DEEC is transferred to the secondary mode or the ENG CONTR switch is OFF the MFC schedules the engine fuel flow, start bleed position and RCVV position hydromechanically in response to throttle movement, inlet static pressure and engine inlet total temperature.

ENGINE MONITORING SYSTEM (F100-PW-220)

The F100-PW-220 engine incorporates an engine monitoring system which consists of the DEEC and the engine diagnostic unit (EDU). The DEEC and EDU continuously monitor electrical control components and engine operation to detect engine failures. Abnormal engine operation and either intermittent or hard failures of components are detected and flagged for maintenance. During abnormal engine operation or component failure, the EDU will record engine and aircraft data as an aid to maintenance troubleshooting. The EDU also maintains engine life cycle information. An airframe mounted GO, NO-GO flag, located on the avionics status panel in the nose wheelwell, is tripped if a fault is detected which requires immediate maintenance attention.

IGNITION SYSTEM (F100-PW-100)

Each ignition system contains an independent engine mounted generator and three igniter plugs (two for the engine and one for the afterburner). During engine start, moving the throttle from OFF to IDLE causes the engine igniter plugs to discharge. Ignition then remains continuous during engine operation. When the throttle is moved into afterburner, afterburner ignition is activated for approximately 1-1/2 seconds. For a second afterburner ignition cycle, the throttle must be retarded to MIL or below and then returned to afterburner.

In the F100-PW-220 engine, an additional afterburner ignitor is provided and afterburner ignition is automatically recycled, in the event of a no-light or blowout, without retarding the throttle to MIL.

AFTERBURNER SYSTEM (F100-PW-100)

The afterburner has five stages that are progressively selected as the throttle is moved from MIL to MAX. In the upper left corner of the engine envelope the fifth stage is not selectable.

In addition, the F100-PW-220 engine uses a light-off detector to signal the DEEC if a light-off occurs. The DEEC then schedules the AFC fuel flow for the remaining segments. If the LOD does not sense a light-off or a blowout occurs, the DEEC automatically resets the MFC to MIL and terminates afterburner fuel flow. A check of the LOD is performed and an afterburner relight is attempted if it checks good. If the LOD is failed, a relight will not be attempted unless the throttle is retarded to MIL and returned to afterburner. Afterburner is inhibited in the ENG CONTR OFF mode.

VARIABLE AREA EXHAUST NOZZLE

The engine has a convergent-divergent nozzle system which is continuously variable between minimum and maximum opening. The nozzle is positioned pneumatically by engine bleed air.

Exhaust Nozzle Control

The nozzle is controlled by throttle position and landing gear handle position. With the gear handle down, throttle in IDLE and the EEC (F100-PW-100 engine) or the DEEC (F100-PW-220 engine) on the nozzle will be approximately 80% open. As the throttle is advanced, the nozzle closes to near minimum area. With the landing gear handle up, the nozzle is near minimum area at all times except at MIL or above. At MIL the nozzle indicators will show the nozzles slightly open (5 - 10%), and the F100-PW-100 engine EEC begins trimming the nozzle position. As the throttle is advanced in the afterburner range the nozzles will schedule further open to compensate for increasing afterburner fuel flow. With the EEC (F100-PW-100 engine) off or inoperative or with the DEEC (F100-PW-220 engine) off or in secondary mode, nozzle position will be closed to near the minimum area in flight or on the ground (except when afterburner is selected with the F100-PW-100 engine). This will result in higher idle thrust and taxi speeds.

ENGINE CONTROLS AND INDICATORS

Engine Master Switches

Two guarded engine master switches are on the engine control panel. Placing either switch to ON (with electrical power available), directs power to the fuel transfer pumps. Each switch directs power to its corresponding FTIT indicator and opens its corresponding airframe mounted engine fuel shutoff valve. The engine master switch must be ON before the corresponding engine can be coupled to the JFS. Placing the switch OFF decouples the engine from the JFS. If engine control/essential power is not available, placing an engine master switch OFF will not shut off its airframe mounted engine fuel shutoff valve.

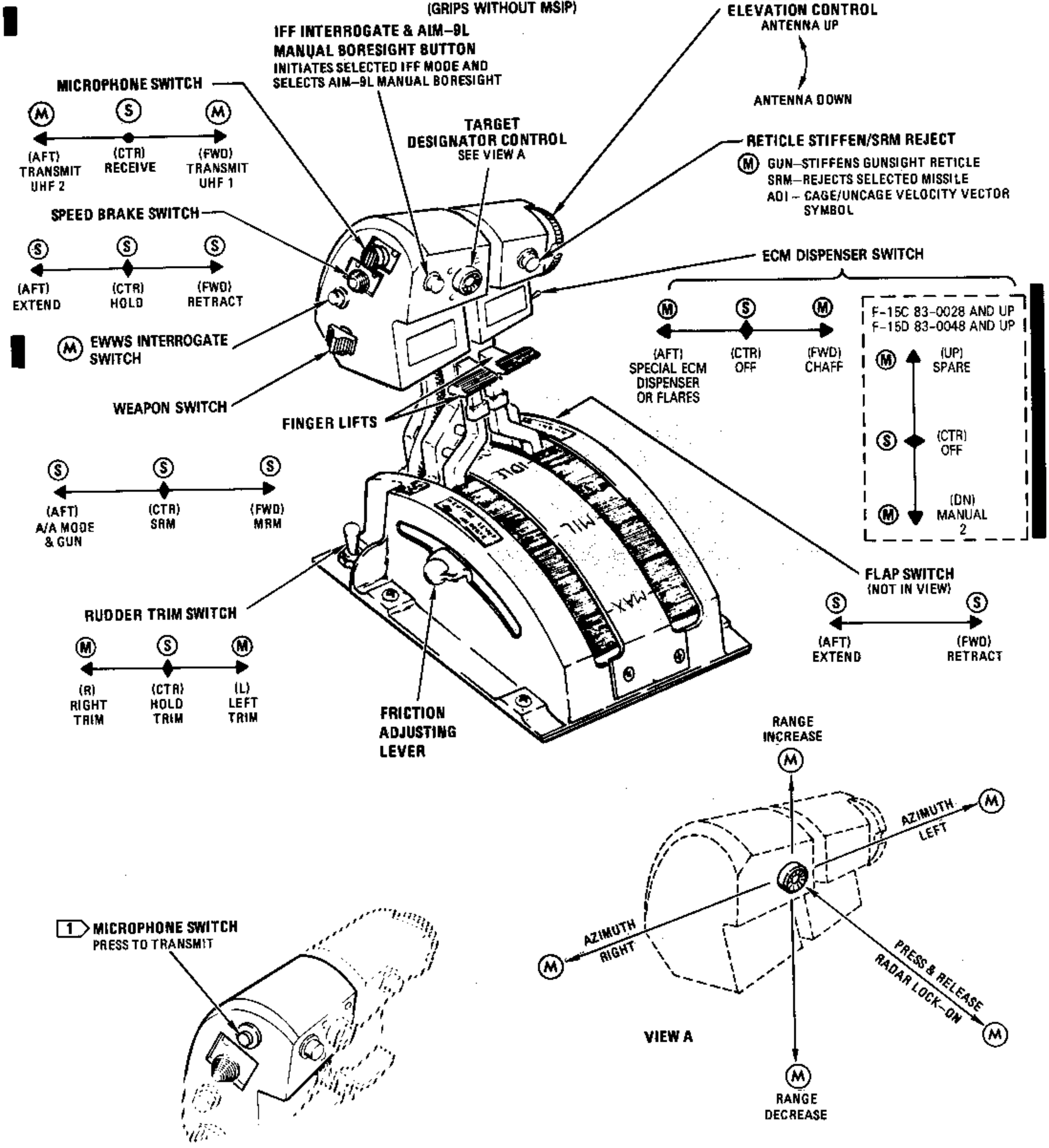
Engine Start Fuel Flow Switches (F100-PW-100)

The engine start fuel flow switches, on the right console, provide improved starting performance under certain ambient temperatures and elevation. The switches have positions of HIGH, AUTO and LOW and are spring loaded to the lever-locked AUTO position.

HIGH	Provides a rich fuel flow for starts and overrides the automatic sequence.
AUTO	Provides a lean fuel flow during normal start. Fuel flow is lean until 30 seconds after main generator comes on the line then automatically increases 100 pph (rich)
LOW	Fuel flow will drop approximately 100 pph when this position is selected.

THROTTLE QUADRANT

(GRIPS WITHOUT MSIP)



NOTES

1 F–15A/B AIRPLANES BEFORE TO 1F–15–857

LEGEND

Ⓜ MOMENTARY–MUST BE HELD FOR CONTACT

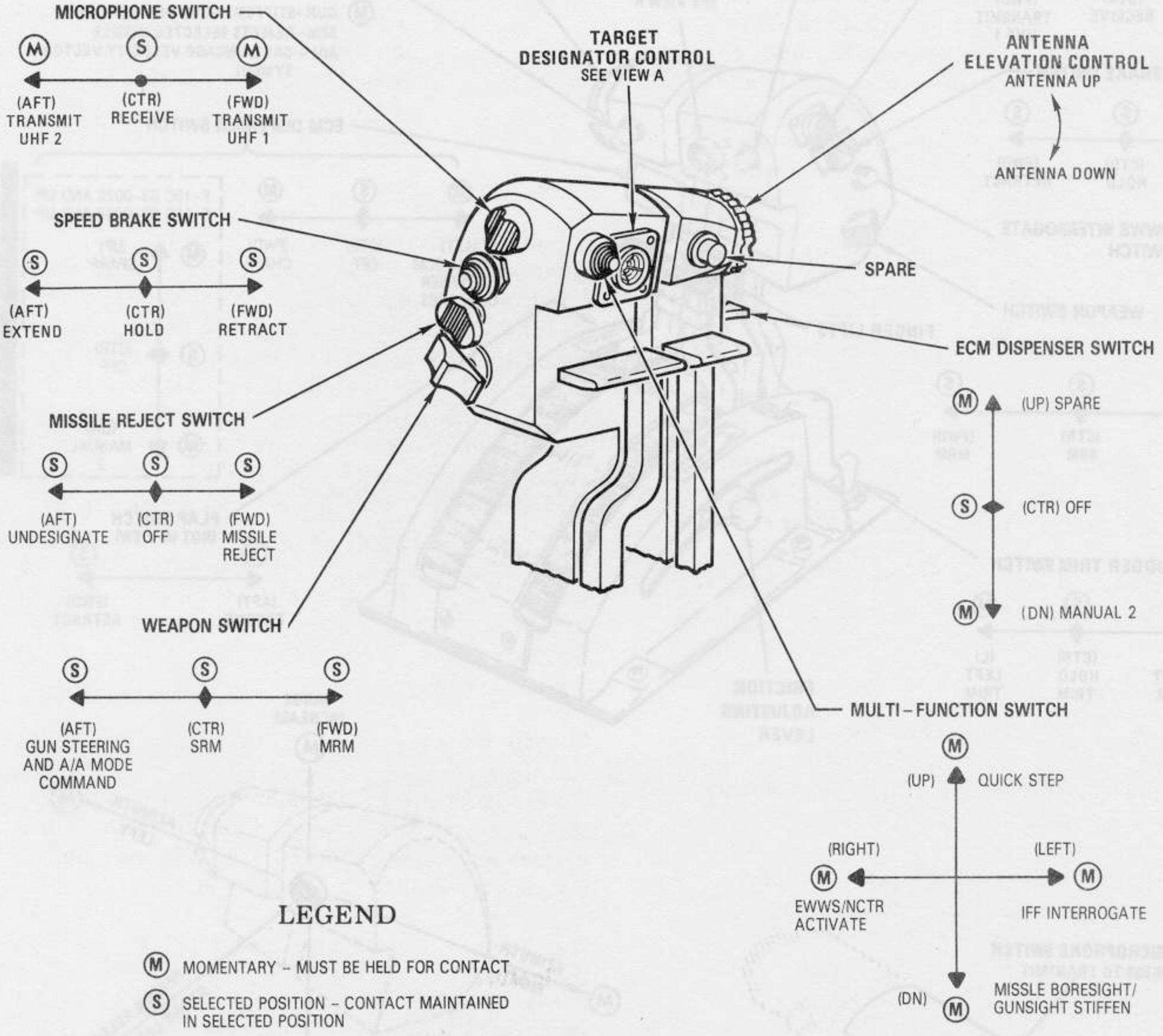
Ⓢ SELECTED POSITION–CONTACT MAINTAINED IN THE SELECTED POSITION

15A–1–(108–1)K

Figure 1–2. (Sheet 1 of 2)

THROTTLE QUADRANT

(GRIPS WITH MSIP)



15A-1-(108-2)K

Figure 1-2. (Sheet 2)

Throttles

Movement of the throttle is transmitted by mechanical linkage to the engine unified control (UC). A friction adjusting lever is mounted adjacent to the right throttle. Finger lifts on the throttle couple the JFS to the engine during starting; they must also be lifted before the throttles can be moved from IDLE to OFF. After TO 1F-15-831, the finger lifts must be lifted to move the throttles below IDLE and must then be released to move the throttles to OFF. Advancing the throttle from OFF to IDLE (during engine start) opens the main fuel shutoff valve in the fuel control and turns on engine ignition. Movement of the throttle from IDLE to OFF closes the main fuel shutoff valve in the fuel control, stopping fuel flow to the engine. Afterburner light-off is initiated by advancing the throttle forward of the afterburner detent.

Throttle Quadrant

The throttle quadrant contains the throttles, finger lifts, friction adjusting lever, rudder trim switch and flap switch. Additionally, the throttle grips contain switches to provide various system controls without moving the left hand from the grips. Refer to figure 1-2.

EEC Switches (F100-PW-100)

The L and R EEC (engine electronic control) switches are located on the engine control panel and provide power to the EEC. The switches have two positions ON and OFF.

ON	Turns on power to EEC.
OFF	Turns off EEC supervisory control of UC. Exhaust nozzle remains closed with gear handle down.

ENG CONTR Switches (F100-PW-220)

The L and R ENG CONTR (engine control) switches are located on the engine control panel and provide power to the DEEC. The switches have two positions ON and OFF.

ON	Turns on power to DEEC for normal engine control.
OFF	Turns off DEEC and transfers engine control to secondary mode (hydromechanical). Afterburner inhibited, engine rpm reduced to 80% max, and exhaust nozzle will remain closed with gear handle down.

Vmax Switch

Use of the Vmax Switch is prohibited. The Vmax switch is below the left canopy sill. The switch has a guard which is wired down. When the wire is broken and the guard raised, the switch may be placed to Vmax which arms the system. With the system armed, the throttle in MAX AB, and airspeed above MACH 1.1, the engine control schedules a 22°C increase in FTIT and a 2% increase in rpm. Main engine and afterburner fuel flow is increased about 4% and thrust is increased about 4%, maximum continuous time in Vmax is 6 minutes. Each use of Vmax must be reported so that a hot section borescope inspection may be performed. Maximum total Vmax time before engine overhaul is 60 minutes.

Tachometers

Tachometers are mounted on the right side of the main instrument panel. Each indicator has a pointer and digital readout that indicates the core engine speed in percent rpm.

Fan Turbine Inlet Temperature (FTIT) Indicators

FTIT indicators are mounted on the right side of the main instrument panel. Each indicator has a pointer and a digital readout that indicates temperature in increments of 10 degrees Centigrade. Refer to Emergency Equipment, this section, for voice warning associated with FTIT.

Fuel Flow Indicators

The indicators, on the main instrument panel, display fuel consumption per engine (with both a pointer and a counter) in pounds per hour. Total engine fuel flow including afterburner is displayed.

Inlet Light

The L and R INLET lights, on the caution light panel, come on under the following conditions, depending on the inlet ramp switch position:

AUTO	AIC has failed, ramp position error, or the diffuser ramp did not lock or unlock at the appropriate Mach number.
EMERG	The diffuser ramp did not lock up.

EEC Light (F100-PW-100)

The L and R EEC lights, on the caution light panel, come on if the engine electronic control has failed or the EEC switch is off. An engine overspeed condition will also turn on the EEC light and automatically turn the EEC off (even though the EEC switch is on). If the EEC light comes on due to an overspeed, the EEC cannot be reset. During engine start the EEC light may come on. The light should go out (if still on) when the EEC switch is cycled after engine start.

ENG CONTR Light (F100-PW-220)

The L and R ENG CONTR lights, located on the caution light panel, come on if the DEEC has transferred control to the secondary mode or the ENG CONTR switch is off. Loss of Mach number signal or an afterburner inhibit (either the last 3 segments or a total afterburner inhibit) will also turn on the ENG CONTR light.

Oil Pressure Indicators

The oil pressure indicators are on the main instrument panel. The scale range is from 0 to 100 psi.

Oil Pressure Light

An OIL PRESS light, on the caution light panel, comes on if oil pressure is low. The signal comes from either oil pressure indicator.

Exhaust Nozzle Position Indicators

Exhaust nozzle position indicators, which show the exit area of the convergent nozzle in % of open, are on the main instrument panel. The indicators operate from movement of the exhaust nozzle control motor drive. Therefore, if the drive cable fails, the position indicator will show normal operation but the convergent exhaust nozzle will not move.

ENGINE STARTING SYSTEM

The engine is started by a small jet engine mounted on the central gearbox. This jet fuel starter (JFS) in conjunction with the AMAD provides cranking and initial electrical power for engine start. The engine starting system is complete in itself and no external power is required for starting. The JFS provides the only means of cranking the engines.

FIRE WARNING/EXTINGUISHING SYSTEM

The fire warning and extinguisher system consists of three illuminating pushbutton switches, one fire extinguisher bottle, a discharge/test switch, and dual-loop temperature sensors (located in the engine bay forward of the afterburner spray bars). The system provides engine and AMAD fire and overheat warning, emergency engine and JFS shutdown, and selective fire extinguishing. The extinguisher is a gaseous system which provides one-shot, one-compartment extinguishing capability. The gas is non-toxic, non-corrosive and will not damage aircraft components. Electrical power is required to operate the fire warning and extinguisher system. During JFS operation, before the emergency generator comes on the line, only the AMAD system is operative.

FIRE/OVERHEAT LIGHTS

The fire/overheat lights come on if a fire or overheat condition exists. Two of the lights are marked ENG FIRE PUSH with arrows pointing left or right. The third light is marked AMAD FIRE PUSH. A flashing light indicates an overheat condition and a steady light indicates a fire. Pressing the ENG FIRE PUSH light shuts off bleed air from, and fuel flow to, the corresponding engine, and arms the extinguisher bottle for release into the selected engine compartment. After the ENG FIRE PUSH light is pressed, the engine decelerates but may continue running at sub-idle rpm for up to 30 seconds until the fuel is consumed downstream of the airframe mounted fuel shutoff valve. Pressing the AMAD FIRE PUSH light arms the extinguisher bottle for release into the AMAD/JFS compartment but will not prevent normal JFS operation. When arm is selected, approximately 1/8 inch of yellow and black stripes will be visible around the outer edges of the light(s). The fire/overheat lights must be pressed again to dearm the extinguisher and restore the selected system to normal operation. Refer to Emergency Equipment, this section, for voice warning associated with FIRE/OVERHEAT lights.

DISCHARGE/TEST SWITCH

A discharge/test switch is located on the fire warning/extinguishing panel.

OFF	System provides normal fire and overheat warning.
TEST	Turns on the three fire/overheat lights (only the AMAD light if the JFS is providing electrical power) indicating the temperature sensors are operational. Tests the continuity of the entire warning system circuit. Switch is spring loaded to OFF.
DISCHARGE	Momentary contact immediately discharges the extinguisher into the selected compartment. If the AMAD circuit was selected, the discharge switch also shuts off fuel flow to the JFS. The switch is lever-locked from OFF to DISCHARGE and is spring loaded to OFF.

SECONDARY POWER SYSTEM

The secondary power system provides power for starting the aircraft engines and transmits power from the engine to the aircraft accessories. It consists of an accumulator-powered hydraulic motor, central gearbox (CGB), jet fuel starter

(JFS), and left and right airframe mounted accessory drive (AMAD) gearboxes.

GEARBOXES

During JFS start, the CGB provides the mechanical connection between the hydraulic motor and the JFS. After the JFS is started, the CGB then provides the gearing and clutching functions necessary to transmit power from the JFS to the left or right AMAD gearboxes. The left and right AMAD gearboxes are directly connected to their respective engine, utility hydraulic pump, power control (PC) hydraulic pump, and integrated drive generator (IDG). During engine start, power is transmitted from the JFS through the CGB and through the applicable AMAD gearbox to the engine. Once the engine is started, the CGB decouples from the AMAD gearbox and the engine then drives the AMAD gearbox and its associated accessories. The accessories on either AMAD gearbox are sufficient to support the aircraft systems if one engine or its associated AMAD gearbox fails. Refer to figure 1-3.

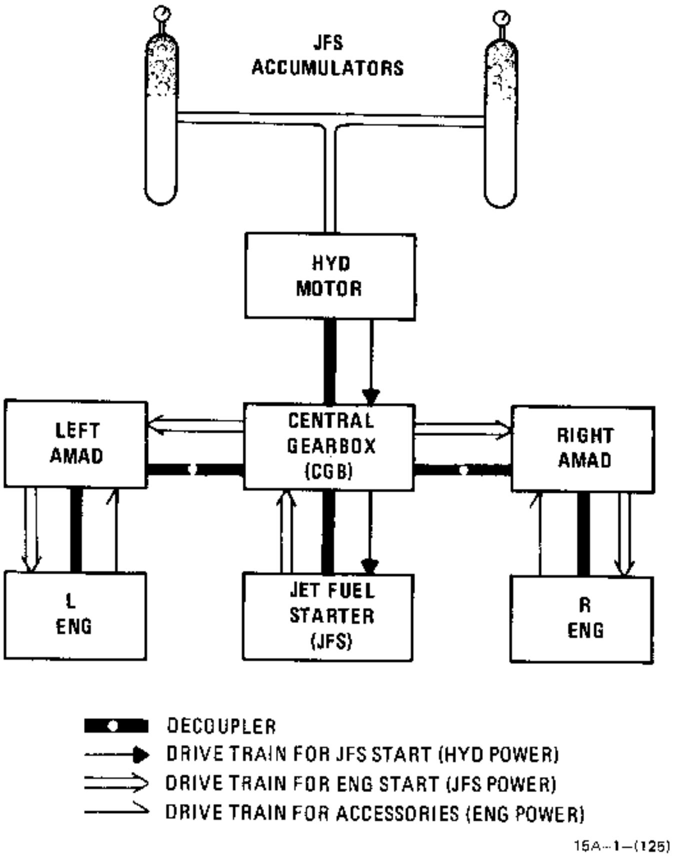


Figure 1-3

JET FUEL STARTER (JFS)

A JFS, mounted on the central gearbox, is used for engine starting. It can start either engine, but not both simultaneously. JFS operation is controlled by the JFS starter switch and the JFS control handle; fuel is provided by the main aircraft fuel system. JFS ignition and electrical power are provided by the JFS generator (permanent magnet). Starting power to the JFS is provided by a hydraulic motor that is driven by hydraulic pressure accumulators. The accumulators are charged automatically by circuit B of the utility hydraulic system, or manually by hand pump. The JFS automatically shuts down when the second engine reaches approximately 50% rpm. The JFS may be used inflight to perform a JFS Assisted Restart, refer to section III.

JFS Starter Switch

The jet fuel starter switch is on the engine control panel located on the right console. It has positions of ON and OFF. During engine start, the JFS is automatically shut down after both engines are started; however, it can be shut down at any time by placing the switch OFF.

JFS Ready Light

The JFS ready light is on the engine control panel located on the right console. The light indicates the JFS is ready to be engaged. The light goes out when the JFS shuts down.

JFS Control Handle

The JFS control handle is located on the lower right corner of the main instrument panel. Pulling the handle straight out discharges one JFS accumulator. Rotating the handle 45° CCW and pulling discharges both accumulators, or the remaining accumulator if one has already been discharged. The handle is spring loaded to return to its normal position.

JFS Low Light

A JFS LOW light, on the caution light panel, comes on if either JFS accumulator pressure is low.

AIRCRAFT FUEL SYSTEM

Refer to foldout section for airplane and engine fuel system illustration. Fuel is carried internally in four interconnected fuselage tanks, and two internal (wet) wing tanks. External fuel is carried in three 600 gallon external tanks. The external tanks are mounted on the centerline and inboard wing station pylons and are completely interchangeable. On F-15C/D aircraft, conformal fuel tanks (CFT) may be mounted on the outboard side of each engine nacelle. Each CFT is compartmented and automatically sequences compartment fuel transfer to maintain center of gravity. All tanks may be refueled on the ground through a single pressure refueling point, airborne they can be refueled through the aerial refueling receptacle. External tanks may be individually fueled through external filler points. The internal wing tanks and tank 1 are transfer tanks. On F-15C/D aircraft, tank 1 consists of one main tank and a left and right auxiliary tank. The tanks are so arranged that all internal fuel will transfer even if the transfer pumps fail. On F-15C/D aircraft, CFT fuel is transferred by transfer pumps to any internal tank that will accept it. Regulated engine bleed air pressure transfers fuel from the external tanks to any internal tank that will accept it and also provides a positive pressure on all internal fuel tanks. On F-15A/B aircraft before TO 1F-15-753, the fuel tanks are not pressurized until the weight is off the wheels. On F-15A/B aircraft after TO 1F-15-753 and all F-15C/D aircraft, the fuel tanks are not pressurized until the gear handle is UP. On F-15C/D aircraft, each CFT is pressurized by a self-contained ram air pressurization and vent system. Float type fuel level control valves control fuel level during refueling or fuel transfer operations. On F-15C/D aircraft during refueling, the transfer pump in tank 1 is shut off, causing the interconnect valve between tank 1 and the left auxiliary tank to open and the left and right auxiliary tanks then fill as tank 1 fills. During transfer, fuel will only gravity transfer to the auxiliary tanks through a standpipe located near the top main tank of tank 1. All internal, CFT and external fuel (except engine feed tanks) may be dumped overboard from an outlet at the trailing edge of the right wing tip. All internal fuel tanks are vented through the vent outlets at each wing trailing edge. The external tanks are vented through the vent outlets in their individual pylons. Each CFT is vented through its vent outlet near the back of the CFT. The fuel quantity indicating system provides fuel quantity, in pounds, of all internal, CFT and external fuel. Refer to Servicing Diagram, this section, for fuel grade and specifications.

SURVIVABILITY

The internal fuel tanks, all of which are located forward of the engines, contain foam for fire/explosion protection. The feed tanks are self-sealing. Fuel lines are routed inside tanks where possible, and most have self-sealing protection when outside the tanks. All CFT compartments incorporate explosion suppression foam slabs for enhanced survivability.

TRANSFER

The fuel internal transfer system is completely automatic and includes: An internal transfer system that provides sufficient fuel flow to keep feed tanks full for all but extremely high fuel flows, backup gravity transfer at reduced flows and at reduced feed tank levels, and an independent CFT and external fuel transfer system which transfers to all internal tanks. Any sustained fuel imbalance greater than 200 pounds between internal wing tanks should be reported on AFTO Form 781. Conformal fuel tanks contain matched transfer pumps but no fuel imbalance limits have been established. The maximum expected CFT imbalance with normal transfer is 500 pounds. Internal fuel transfer is accomplished by three electric transfer pumps and on F-15C/D aircraft, two fuel ejector pumps. The electric pumps automatically transfer internal wing and tank 1 fuel to the engine feed tanks when the level control valve(s) in either of the two feed tanks is open. The transfer pumps run continuously when electrical power is applied to the aircraft and an engine master switch is on. However, on F-15C/D aircraft, tank 1 transfer pump will not run unless the slipway switch is in CLOSE even if the FUEL LOW light is on. If the electric transfer pumps fail, fuel from all internal tanks will gravity transfer at a reduced rate to the engine feed tanks. Check valves prevent fuel flow from the feed tanks to the transfer tanks. On F-15C/D aircraft, the fuel ejector pumps in the left and right auxiliary tanks automatically transfer fuel to main tank 1 when its transfer pump is operating. If the ejector pumps or tank 1 transfer pump fails, fuel will gravity transfer (through the open ejector pump) at a reduced rate as the level of main tank 1 decreases. External fuel is transferred by engine bleed air pressure. On F-15A/B aircraft before TO 1F-15-753, engine bleed air pressure is not supplied to the external tanks until weight is off the wheels. On F-15A/B aircraft after TO 1F-15-753 and all F-15C/D aircraft, engine bleed air pressure is not supplied to the external tanks until the landing gear handle is UP. On F-15A/B aircraft after TO 1F-15-753 and all F-15C/D aircraft, external fuel will not transfer with the gear handle down or the slipway switch is OPEN until the FUEL LOW light comes on. If a complete electrical failure occurs, the external fuel will still transfer. There is no backup provision for the external fuel transfer system. External fuel will normally transfer before the internal tanks start to deplete. External wing tank fuel may not transfer at the same rate or even together, but will normally transfer before centerline fuel. Internal and all external tanks can deplete simultaneously whenever engine fuel consumption exceeds transfer capability.

External Tank Fuel Control Switches (F-15A/B)

Two external tank fuel control switches, labeled WING (for external wing tank(s) and CTR (for centerline tank), are located on the fuel control panel. These switches are inoperative when tanks are not aboard.

NORM	Provides normal transfer and refuel of external tanks.
STOP TRANS	Stops transfer from external tanks, unless FUEL LOW light is on, in which case fuel will transfer regardless of switch position. Before TO 1F-15-753, if selected prior to air refueling, will prevent filling of the tank(s) selected.
STOP REFUEL	Will prevent filling of the tank(s) selected.

CFT AND EXTERNAL TRANSFER (F-15C/D)

CFT fuel transfer is sequenced within the CFT's and with external tanks to automatically maintain the aircraft center of gravity within limits. The external transfer switch provides the option to use either CFT or external tank fuel first.

Internal CFT Transfer Sequencing

Each CFT contains two transfer pumps, one in the center compartment sump and one in the aft compartment sump. The sumps are connected by a float controlled interconnect valve which isolates the sumps until the aft compartment is almost empty or the aft transfer pump fails. Each CFT also contains an ejector pump that is operated by the center pump and transfers fuel

All data on pages 1-10A thru 1-10B deleted.

from the forward compartment to the center compartment. During normal CFT transfer, both the center and aft compartment transfer pumps and the ejector pump operate. Until the sump interconnect valve opens, the center pump transfers forward/center compartment fuel and the aft pump transfers aft compartment fuel. When the aft compartment fuel level drops below the interconnect float valve level, the interconnect valve opens connecting the two sumps. This allows both transfer pumps to transfer forward/center compartment fuel until the forward/center fuel level depletes to the aft compartment level.

CFT/External Tank Transfer Sequencing

CFT's and external tanks normally will transfer in sequence and not together. The sequence order is determined by the external transfer switch once the aircraft is off the ground (gear handle up). On the ground, CFT's will transfer to maintain the internal system full since the external tanks are depressurized and unable to transfer.

The WING/CTR position on the external transfer switch provides external tank transfer and CFT's do not transfer as long as the external transfer rate is sufficient to maintain full internal fuel. The CFT position similarly provides only CFT transfer as long as it maintains a full aircraft. If the aircraft internal tanks are not kept near full, due to either high engine fuel consumption or depletion of the selected tank, tank 1 automatic transfer is activated when the tank 1 fuel level drops and causes CFT's and external tanks to transfer simultaneously. This automatic transfer shuts off once the added fuel flow refills tank 1 and is reinitiated if the level drops again.

External/Conformal Tank Fuel Control Switches

Two external tank fuel control switches, labeled WING (for external wing tanks) and CTR (for centerline tank), and a conformal tank fuel control switch labeled CONF TANK are on the fuel control panel. If CFT's are not installed, the CONF TANK switch should be placed in the STOP TRANS position to prevent a malfunction in the combined CFT/external tank control system from affecting external tank transfer.

NORM	Provides normal transfer and refuel of corresponding tanks.
STOP TRANS	Stops transfer from corresponding tanks, including automatic external transfer, unless FUEL LOW light is on, in which case fuel will transfer regardless of position of this switch.
STOP REFUEL	Will prevent filling of the tank(s) selected.

Conformal Tank Emergency Transfer Switch

The conformal tank emergency transfer switch, labeled CONF TANK EMERG TRANS, is on the fuel control panel. This switch should be placed in NORM when the conformal tanks are not installed. If the switch is placed in L or R (with or without conformal tanks installed) and only emergency generator power is available, all aircraft pitot heaters are deactivated. With CFT's installed, switch operation is as follows:

GEN(S) ON LINE (WITH TEWS OR ICS ON)	SW POS NORM	SW POS L or R
Both main gen	No effect	No effect
One main gen	Center pump off in each CFT.	Activates center pump.
Emer gen only (with sw in AUTO or MAN)	Pitot probe heaters on and all CFT pumps off.	Pitot probe heaters off and center pump in selected CFT on.

External Transfer Switch

The external transfer switch labeled EXT TRANS is on the fuel control panel. This switch should be placed in WING/CTR when conformal tanks are not installed.

Selection of WING/CTR allows external tank fuel to continuously transfer maintaining the internal tanks full. If WING/CTR is not selected and conformal fuel tanks are not installed cyclic external tank fuel transfer will occur. The internal tanks will deplete by approximately 3000 pounds and actuate a low level sensor in tank 1. External fuel will then transfer until a high level sensor is actuated in tank 1. External fuel transfer will then stop and the internal tanks will again deplete. If the external transfer switch is not set to WING/CTR this cycling will continue until the external tanks empty.

Selection of CONF allows the conformal tank fuel to continuously transfer maintaining internal tanks full. If CONF is not selected and external tanks are not installed cyclic conformal tank fuel transfer will occur. The internal tanks will deplete by approximately 3000 pounds and actuate a low level sensor in tank 1. Conformal tank fuel will then transfer until a high level sensor is actuated in tank 1. Conformal fuel transfer will then stop and the internal tanks will again deplete. If the external transfer switch is not set to CONF this cycling will continue until the conformal tanks are empty.

FUEL FEED SYSTEM

There are two separate fuel feed systems, one for each engine. During normal operation, fuel temperature is controlled by fuel recirculation to the internal wing tanks. The internal wing tanks act as a heat exchanger to lower the fuel temperature before it again transfers to the feed tanks. Baffles in the feed tanks provide limited fuel supply for the left and right main boost pumps during negative g or inverted flight. During normal operation, the right main boost pump supplies fuel to the right engine only, and the left main boost pump supplies fuel to the left engine only. Below 1000 pounds total feed tank fuel, feed tanks may not feed simultaneously. The main boost pumps are capable of providing pressurized fuel flow to the engines at all power settings throughout the flight envelope. If either or both main boost pumps fail or, either or both main generators are inoperative or both transformer-rectifiers fail, the emergency boost pump is activated and a system of tank interconnect and crossfeed valves allows the remaining operating pump(s) to supply all usable fuel in the feed tanks to both engines. With one main boost pump and the emergency boost pump operating, pressurized fuel is supplied to both engines at all non-afterburner power settings throughout the entire flight envelope. With double boost pump failure (any two), the remaining pump is capable of supplying fuel to both engines at all non-afterburner power settings from sea level to 30,000 feet. With boost pump failure(s), reduced fuel flow capacity will not allow unrestricted afterburner operation. If both main boost pumps and the emergency boost pump are inoperative, fuel is available to the engines by suction feed only. Under most flight conditions the engine requires pressurized (boosted) fuel to preclude fuel vaporization. Therefore, loss of both main and emergency boost pumps may cause dual engine flameout. During single-engine operation, the feed tank of the inoperative engine will not feed to the operative engine until the fuel level of the good engine feed tank is well below FUEL LOW light activation.

Boost Pump Caution Lights

Two boost pump lights are located on the caution light panel. These lights are marked L BST PMP (for left main boost pump) and R BST PMP (for right main boost pump) and come on if the associated boost output pressure is low.

Emergency Boost On Light

The EMER BST ON light, on the caution light panel, comes on any time the emergency generator is operating and sufficient emergency boost pump output pressure is available.

Fuel Hot Light

The FUEL HOT light, on the caution light panel, illuminates when the engine fuel inlet temperature is too high.

FUEL TANK PRESSURIZATION AND VENT

The pressurization and vent system provides regulated engine bleed air pressure to all internal tanks to prevent fuel boil-off at altitude and to the external tanks for fuel transfer. The system also provides pressure relief of the fuel tanks during climbs, and vacuum relief of the fuel tanks, as required, during descents. On F-15A/B aircraft before TO 1F-15-753, the internal and external tanks are pressurized when weight is off the wheels. On F-15A/B aircraft after TO 1F-15-753 and all F-15C/D aircraft, the internal and external tanks are pressurized when the landing gear handle is UP. On landing the internal and external tanks are depressurized when the landing gear handle is DOWN.

The pressurization and vent system is self-contained for each CFT. Each CFT provides regulated ram air pressure (from a flush inlet on the side of the CFT) to all three compartments to maintain positive tank pressures. The system also provides pressure relief of the CFT through the overboard vents during climb and air refueling, and vacuum relief during ground operation.

FUEL QUANTITY INDICATING SYSTEM

The fuel quantity indication system provides readings, in pounds, of usable internal, CFT and external fuel. Refer to figure 1-4. The system components include the fuel quantity indicator, a built-in-test (BIT), a BINGO light, and an independent FUEL LOW light.

Fuel Quantity Indicator

A combination pointer-counter fuel quantity indicator is on the lower right side of the main instrument panel. Refer to figure 1-4. The pointer indicates total internal fuel (with readings multiplied by 1000). The upper counter marked TOTAL LBS indicates total internal fuel plus CFT and external fuel. The two lower counters, marked LEFT and RIGHT, and a selector switch provide individual tank monitoring and a check of the indicator. An OFF flag will be displayed if no electrical power is available. Erroneous fuel indications resulting from fuel slosh will occur during and immediately following maneuvering flight.

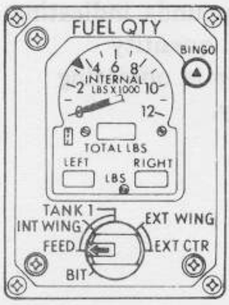
Fuel Quantity Selector Knob

FEED	The fuel remaining in the respective engine feed tanks will be displayed.
INT WING	The fuel remaining in the respective internal wing tanks will be displayed.
TANK 1	The fuel remaining in tank 1 will be displayed in the LEFT counter (RIGHT will indicate zero).
EXT WING	The fuel remaining in the respective external wing tanks will be displayed.
EXT CTR	The fuel remaining in the external centerline tank will be displayed in the LEFT counter (RIGHT will indicate zero).
CONF TANK	The fuel remaining in the respective conformal tank will be displayed.
BIT	A spring-loaded position that will drive the internal (pointer) and total (counter) indicators to 6000 pounds, and the LEFT and RIGHT (counters) to 600 pounds indicating the fuel quantity indicator is operating normally.

FUEL QUANTITIES

(F-15A/B)

TANK		USABLE FUEL				
		GALLONS	JP-4		JP-8	JP-5
			POUNDS AT 6.5 LB/GAL	POUNDS AT 6.3 LB/GAL	POUNDS AT 6.7 LB/GAL	POUNDS AT 6.8 LB/GAL
TANK 1 1		508	3300 ± 100	3200 ± 100	3400 ± 100	3450 ± 100
RIGHT ENG FEED TANK		234	1500 ± 100	1500 ± 100	1550 ± 100	1590 ± 100
LEFT ENG FEED TANK		184	1200 ± 100	1150 ± 100	1250 ± 100	1250 ± 100
INTERNAL WING TANKS	L	422	2750 ± 200	2650 ± 200	2800 ± 200	2870 ± 200
	R	422	2750 ± 200	2650 ± 200	2800 ± 200	2870 ± 200
TOTAL INTERNAL FUEL		1770	11,500 ± 450	11,150 ± 450	11,850 ± 450	12,040 ± 450
EXTERNAL WING TANKS	L	610	3950 ± 250	3840 ± 250	4090 ± 250	4150 ± 250
	R	610	3950 ± 250	3840 ± 250	4090 ± 250	4150 ± 250
INTERNAL FUEL PLUS EXTERNAL WING TANKS		2990	19,400 ± 600	18,830 ± 600	20,030 ± 600	20,330 ± 600
EXTERNAL ℄ TANK		610	3950 ± 250	3840 ± 250	4090 ± 250	4150 ± 250
INTERNAL FUEL PLUS EXTERNAL ℄ TANK		2380	15,450 ± 500	14,990 ± 500	15,940 ± 500	16,180 ± 500
MAXIMUM FUEL LOAD TOTAL INTERNAL PLUS ALL EXTERNAL TANKS		3600	23,350 ± 650	22,670 ± 650	24,120 ± 650	24,480 ± 650



1 ON AIRCRAFT THRU 73–107 SUBTRACT APPROXIMATELY 200 POUNDS FROM THE VALUES FOR TANK 1.

NOTES

THE FUEL QUANTITIES, IN POUNDS, ARE ROUNDED OFF TO READABLE VALUES OF COUNTER PORTION OF THE FUEL QUANTITY INDICATOR; THEREFORE, THE ACTUAL GALLONS TIME 6.5, 6.3, 6.7 OR 6.8 WILL NOT NECESSARILY AGREE WITH THE POUNDS COLUMN.

FUEL WEIGHTS ARE BASED ON JP–5 AT 6.8, JP–8 AT 6.7 AND JP–4 AT 6.5 AND 6.3 POUNDS PER GALLON (DIFFERENCES ARE DUE TO MANUFACTURERS ALLOWABLE TOLERANCES) AND 65 DEGREES F.

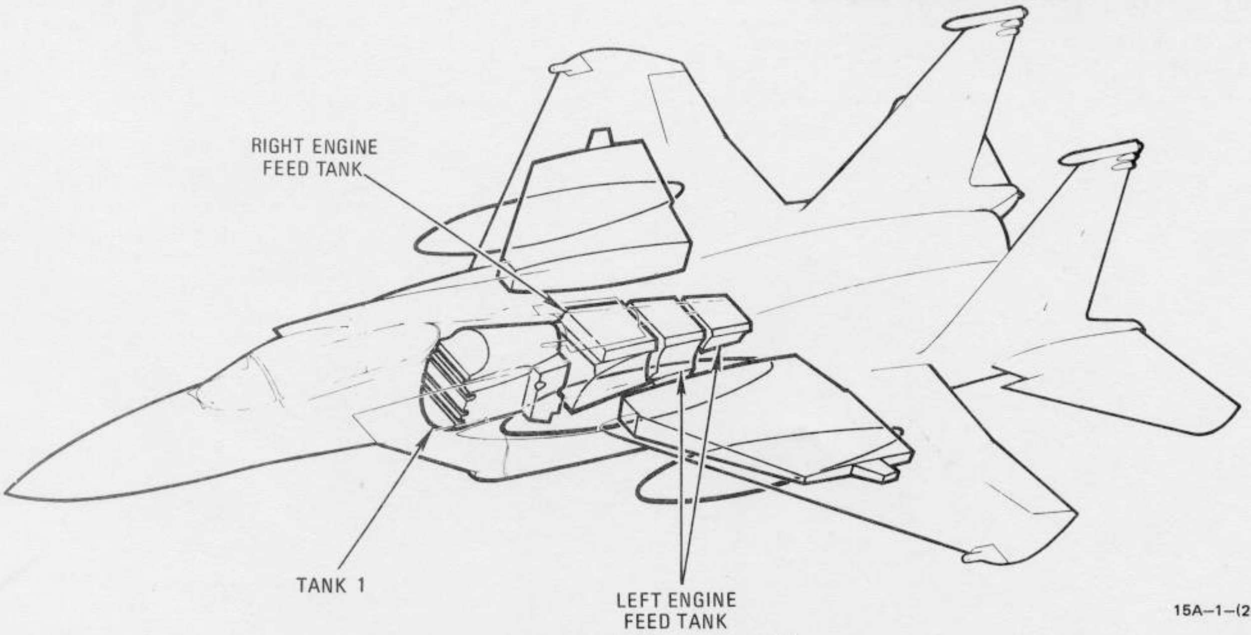
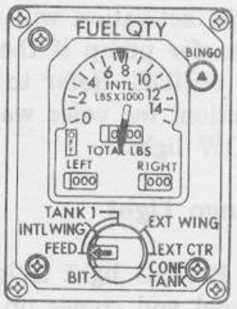


Figure 1-4 (Sheet 1 of 2)

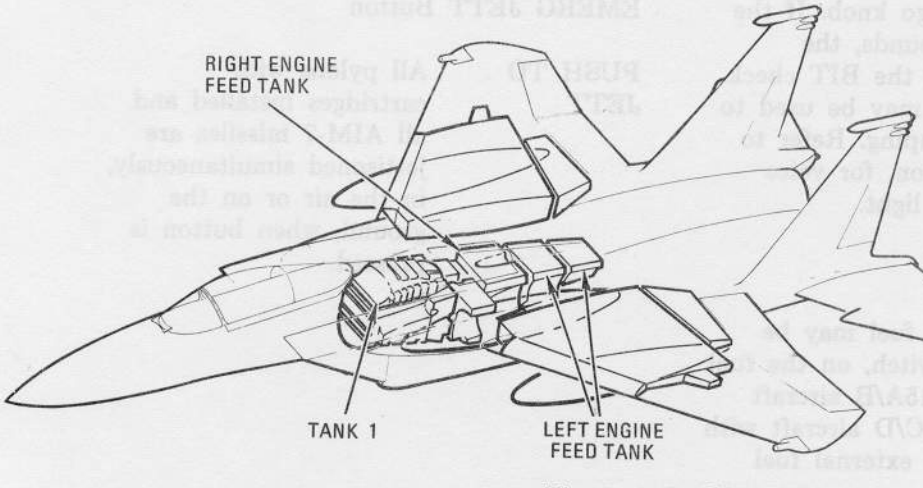
FUEL QUANTITIES
(F-15C/D)

TANK			USABLE FUEL			
			JP-4		JP-8	JP-5
		GALLONS	POUNDS AT 6.5 LB/GAL	POUNDS AT 6.3 LB/GAL	POUNDS AT 6.7 LB/GAL	POUNDS AT 6.8 LB/GAL
TANK 1		655	4250±170	4150±170	4400±170	4450 ± 170
RIGHT ENG FEED (TANK 2)		234	1500±110	1450±110	1550±110	1590 ± 110
LEFT ENG FEED (TANK 3)		189	1250±105	1150±105	1250±105	1290 ± 105
INTERNAL WING TANKS	L	496	3200±270	3150±270	3300±270	3370 ± 270
	R	496	3200±270	3150±270	3300±270	3370 ± 270
INTERNAL FUEL LESS CONFORMAL TANKS		2070	13,450±480	13,050±480	13,850±480	14,080 ± 480
EXTERNAL WING TANKS	L	610	3950±300	3800±300	4100±300	4150 ± 300
	R	610	3950±300	3800±300	4100±300	4150 ± 300
INT FUEL PLUS EXT WING TANKS LESS CONFORMAL TANKS		3290	21,400±850	20,750±850	22,050±850	23,370 ± 850
EXTERNAL ℄ TANK		610	3950±300	3800±300	4100±300	4150 ± 300
INT FUEL PLUS EXT ℄ TANK LESS CONFORMAL TANKS		2680	17,400±770	16,900±770	17,950±770	18,220 ± 770
INT FUEL PLUS 3 EXT TANKS LESS CONFORMAL TANKS		3900	25,350±940	24,550±940	26,150±940	26,520 ± 940
CONFORMAL TANKS	L	[illegible]	4900 ±300	4750 ±300	5050 ±300	5100 ±300
	R	750	4900 ±300	4750 ±300	5050 ±300	5100 ±300
INTERNAL FUEL PLUS CONFORMAL TANKS		3,570	23,200 ±890	22,500 ±890	23,900 ±890	24,300 ±890
INT FUEL PLUS EXT WING TANKS AND CONFORMAL TANKS		4,790	31,150 ±1056	30,200 ±1056	32,100 ±1056	35,600 ±1056
INT FUEL PLUS EXT ℄ TANK AND CONFORMAL TANKS		4,180	27,150 ±970	26,350 ±970	28,000 ±970	28,400 ±970
MAX FUEL LOAD–INT FUEL PLUS 3 EXT TANKS AND CONFORMAL TANKS		5,400	35,100 ±1140	34,000 ±1140	36,200 ±1140	36,700 ±1140



NOTES

- THE FUEL QUANTITIES, IN POUNDS, ARE ROUNDED OFF TO READABLE VALUES OF COUNTER PORTION OF THE FUEL QUANTITY INDICATOR; THEREFORE, THE ACTUAL GALLONS TIME 6.5, 6.3, 6.7 OR 6.8 WILL NOT NECESSARILY AGREE WITH THE POUNDS COLUMN.
- FUEL WEIGHTS ARE BASED ON JP-5 AT 6.8, JP-8 AT 6.7 AND JP-4 AT 6.5 AND 6.3 POUNDS PER GALLON (DIFFERENCES ARE DUE TO MANUFACTURERS ALLOWABLE TOLERANCES) AND 65 DEGREES FAHRENHEIT



15A–1–(2–2)K

Figure 1-4 (Sheet 2)

Fuel Low Light

A FUEL LOW light, on the caution light panel, warns the pilot of a low fuel level in one or both engine feed tanks. The FUEL LOW light is completely independent of the fuel quantity indicating system and is controlled by a sensor in each feed tank. The sensor in the right feed tank is located at the 960 pound level and the sensor in the left feed tank is located at the 540 pound level. If either sensor is exposed (regardless of the combined indicated fuel quantity) the FUEL LOW light will come on. The light normally comes on at 1500 ±200 pounds total internal fuel remaining. The FUEL LOW light may come on with more than 1500 pounds of fuel remaining if fuel transfer falls behind engine fuel consumption because of transfer system failure or sustained high speed afterburner usage. On F-15C/D aircraft, illumination of the FUEL LOW light will activate automatic transfer of fuel from the CFT's and external tanks regardless of cockpit fuel swtich positions. Transfer will stop as soon as feed tanks refill to the sensor levels and will reactivate when the fuel level again drops below the sensors. On F-15C/D aircraft, FUEL LOW light activation will not turn on the tank 1 transfer pump if the slipway switch is in OPEN or ORIDE. Refer to Emergency Equipment, this section, for voice warning associated with FUEL LOW light.

Bingo Light

A BINGO light is located on the caution light panel and comes on at a preset value, controlled by the pilot. An adjustable index (bug) on the face of the indicator may be set to any internal fuel quantity by turning the bingo knob. If the bingo index is set above 6000 pounds, the BINGO light will come on when the BIT check is made. The bingo light circuit may be used to automatically terminate fuel dumping. Refer to Emergency Equipment, this section, for voice warning associated with BINGO light.

FUEL DUMP SYSTEM

All fuel except engine feed tank fuel may be dumped by placing the dump switch, on the fuel control panel, to DUMP. On F-15A/B aircraft after TO 1F-15-753 and all F-15C/D aircraft with the landing gear handle DOWN, external fuel cannot be dumped. Internal and/or CFT fuel is not dependent on the landing gear handle position. The fuel dump switch is spring-loaded to the lever-locked NORM position and is electrically held in the DUMP position (with BINGO light out). When DUMP is selected, a motor-operated dump valve in the right internal wing tank opens. With the dump valve open, the transfer pumps in tank 1 and each internal wing tank force fuel out the right wing dump mast. CFT and/or external fuel transfer into the wing tanks and tank 1, and is then dumped (if STOP TRANS is not selected and, on F-15A/B aircraft after TO 1F-15-753 and all F-15C/D aircraft, for the external tanks, the landing gear handle is UP). If the transfer pumps fail, external fuel passes through a check valve and is dumped directly. Dumping will continue until:

a. NORM is selected on the dump switch.

b. The BINGO light comes on, at which time the dump switch automatically returns to NORM terminating fuel dumping.

c. Only feed tank fuel remains. This can occur if the BINGO bug is below approximately 2700 pounds.

EXTERNAL TANK JETTISON SYSTEM

The external fuel tanks may be jettisoned individually or simultaneously. The EMERG JETT button, A/G SELECT switch, and SELECT JETT switch control tank jettison. (For other stores, including missiles, refer to TO 1F-15A-34-1-1 or TO 1F-15C-34-1-1).

EMERG JETT Button

PUSH TO JETT	All pylons with cartridges installed and all AIM-7 missiles are jettisoned simultaneously, in the air or on the ground, when button is pressed.

F-15A/B and F-15C/D thru 83-0050 - A/G SELECT switch - STA/JETT side.

R	Selects right wing station (8).
C	Selects centerline station (5).
L	Selects left wing station (2).
ALL	Selects three stations (2, 5, and 8).

SELECT JETT Switch

COMBAT	Selects right and left wing stores plus centerline store and pylon.
PYLON	Selects pylon and stores on station(s) selected on A/G SELECT switch.
STORES	Selects stores on stations selected on A/G SELECT switch.
RACK	Jettisons the MER or store from the pylon.
JETT	If the landing gear handle is up or armament safety override switch engaged, pressing this button initiates the jettison sequence for the station(s) or store(s) selected.

F-15C/D 84-0001 and up-Selective Jettison Knob and Button

JETT Button	When pressed, initiates the jettison function selected.
OFF	Removes power from the selective jettison button.
COMBAT	Selective jettison button first press initiates combat jettison program 1. Second press initiates combat jettison program 2.
A/A	Selects air-to-air selective jettison.
A/G	Selects air-to-ground selective jettison.
MAN FF	Not a jettison function. Refer to TO 1F-15C-34-1-2.
MAN RET	Not a jettison function. Refer to TO 1F-15C-34-1-2.
ALTN REL	Not a jettison function. Refer to TO 1F-15C-34-1-2.

AIR REFUELING SYSTEM

The air refueling system has a fixed receptacle, a slipway control switch, a hydraulically operated slipway door, two slipway lights, a receptacle flood-light, a signal amplifier, a READY light, an air refueling release button, an air refuel pressure switch, and an emergency slipway door actuating system. For CG control, a float switch in tank 1 prevents external tank refueling until tank 1 fuel quantity is above approximately 1,560 pounds. For normal and emergency air refueling procedures refer to F-15 Flight Crew Air Refueling Procedures (TO 1-1C-1-25).

Slipway Switch

The three position slipway switch is located on the fuel control panel.

CLOSE	Closes the slipway door, turns on tank 1 transfer pump (F-15C/D), reestablishes external fuel tank pressurization, and fuel sequencing.
OPEN	Shuts off tank 1 transfer pump (F-15C/D), opens the slipway door and, providing the slipway door has opened, a. depressurizes the external fuel tanks if FUEL LOW light not on. b. turns on the receptacle lights.

	c. turns on the READY light indicating the system is ready for boom engagement.
ORIDE	Accomplishes the same function as in OPEN above plus the following: a. Allows boom locking, but the tanker disengage feature (both automatic and manual) is lost. b. The receiver must initiate all disconnects. c. On F-15A/B aircraft after TO 1F-15-753 and all F-15C/D aircraft, bypasses tank 1 float switch and external tanks may be refueled regardless of fuel tank 1.

NOTE

- With the slipway switch in OPEN or ORIDE and the slipway door open, the external tanks are depressurized and descent rate should not exceed 10,000 feet per minute.
- On F-15A/B after TO 1F-15-753 and all F-15C/D aircraft, to prevent an undesirable CG condition when using ORIDE position, STOP REFUEL should be selected for the external tanks until tank 1 fuel quantity is above 1560 pounds.
- On F-15C/D aircraft, FUEL LOW light activation will not turn on the tank 1 transfer pump if the slipway switch is in OPEN or ORIDE.

External Tank Switches (F-15A/B)

The two external tank switches, on the fuel control panel, provide an option of refueling the external tanks. If the switches are in NORM, the external tanks will fill during refueling. If either or both switches are in STOP REFUEL, the corresponding external tank(s) will not fill during refueling. When the external tanks are not installed or have been jettisoned, the switches are inoperative.

External/Conformal Tank Fuel Control Switches (F-15C/D)

The three external/conformal tank switches, on the fuel control panel, provide an option of refueling the external/conformal tanks. If the switches are in NORM, the external/conformal tanks will fill during refueling. If any or all switches are in STOP REFUEL, the corresponding external/conformal tank(s) will not fill during refueling.

Air Refueling Release Button

The auto acquisition button is used as an air refueling release button. When the button is depressed, the receptacle unlatches from the boom.

Emergency Air Refueling Switch

The slipway door can be opened by placing the emergency air refueling switch to OPEN. Pyrotechnic devices powered by the emergency essential 28 volt dc bus open the door which cannot then be closed in flight. Normal slipway lighting will be available but the READY light will not go out during refueling nor will the boom lock in the receptacle. External fuel tank pressurization can be restored by placing the slipway door switch to CLOSE.

GROUND REFUELING

All internal, CFT and external fuel tanks are pressure fueled through a single point receptacle. However, the external tanks may be fueled through individual filler points. No external power is required for single point refueling.

CAUTION

If the fuel dump valve(s) was/were open when electrical power was removed from the aircraft, they/it will remain open until power is reapplied. Fuel will be dumped during refueling if the dump valve(s) is/are open.

ELECTRICAL POWER SUPPLY SYSTEM

The electrical power supply system consists of two main AC generators, two transformer-rectifiers, an emergency AC/DC generator, and a power distribution (bus) system. External electrical power can be applied to the bus system on the ground, and the JFS generator provides electrical power to part of the bus system during an engine start without external power. Refer to foldout section for electrical system simplified schematic.

AC ELECTRICAL POWER

Two AC generators are the primary source of electrical power. The two generators are connected for split bus nonsynchronized operation. This means that with both generators operating each generator supplies power independently to certain aircraft buses. If one generator fails, it drops off the line; and at the same time, power from the remaining generator is provided to the buses of the failed (or turned off) generator. Current limiters are provided to prevent a fault in one generator system from shutting down both generators. Either generator is capable of supplying power to the entire system except that the external ECM pods will automatically switch to STBY during single generator operation. Each generator is activated automatically when its control switch is in the ON position, and the generator is connected to its buses when voltage and frequency are within prescribed limits (approximately 44% engine rpm). A protection system within the generator control unit protects against damage due to undervoltage, overvoltage, over and under frequency, feeder faults, and generator locked rotor. If a fault or malfunction occurs, the generator control unit removes the affected generator from its buses. Except for an under frequency condition, the control switch of the affected generator must be cycled to bring the generator back on the line after the fault or out-of-tolerance condition clears. If the generator drops off the line due to under frequency and the prescribed frequency is restored, the generator will come back on the line automatically. A generator may be removed from its buses at any time by placing the generator control switch to OFF. Indicator lights, labeled L GEN OUT and R GEN OUT, are on the caution lights panel. These lights come on whenever their respective generator drops off the line with power available on the essential 115 VAC bus to illuminate the lights.

Generator Control Switches

Two generator control switches, one for each generator, are on the engine control panel. They are two-position toggle switches with positions of OFF and ON. The switches are lever-lock type and must be raised up before they are moved to a new position.

DC ELECTRICAL POWER

Two transformer-rectifiers (TR) are provided. The outputs of the transformer-rectifiers are connected in parallel; however, protection is provided so that a short on a bus of one TR will not affect the other TR. Also, if one TR fails, the other TR will power the entire DC system. No cockpit warning of single TR failure is provided.

EMERGENCY GENERATOR

A utility hydraulic motor-driven emergency AC/DC generator is provided. The emergency electrical system is separate from the primary electrical system. If either or both main generators are inoperative or both transformer-rectifiers fail, or some combination of faults occur, or if either or both main fuel boost pumps fail, the emergency generator is activated. If only one generator is inoperative or either or both main fuel boost pumps fail, the emergency generator powers the emergency/essential buses only (emergency fuel boost pump and arresting hook). If both generators are inoperative or both transformer-rectifiers fail, the emergency generator supplies the essential AC/DC buses and the emergency/essential buses. After TO 1F-15-764, with aircraft on the ground and the emergency generator switch in AUTO during engine start without external electrical power, the emergency generator automatically shuts off 30 seconds after first main generator comes on the line. The purpose of shutting down the emergency generator is to limit operation on the ground. The 30 second delay is to allow time to check the emergency generator/emergency boost pump system. For engine start using external power, the emergency generator or emergency boost pump will not operate as long as external power is connected. After TO 1F-15-764, with the emergency generator switch in AUTO on the ground, except with external power connected, both the EMER BST ON and BST SYS MAL lights come on in situations (single engine taxi, first engine start, etc.) where a main generator is off the line. The lights will go out when the second main generator comes on the line.

Emergency Generator Control Switch

The emergency generator control switch, on the engine control panel, is a three-position toggle switch with positions of AUTO, MAN, and ISOLATE. The switch is electrically held in the ISOLATE position.

AUTO	Provides automatic activation of the emergency generator if either or both main generators are inoperative, both transformer-rectifiers fail, or either or both main fuel boost pumps fail. After TO 1F-15-764, provides automatic shutdown of the emergency generator 30 seconds after the first main generator comes on the line after a ground start without external power. On all aircraft, for starts with external power the emergency generator will not operate as long as external power is connected.

MAN	Provides manual activation of the emergency generator.
ISOLATE	Restricts the emergency generator to powering the emergency fuel boost pump and arresting hook and provides power from the emergency/essential 28 volt dc bus to the emergency air refueling switch to open the slipway door. On F-15C 83-0035 and up and F-15D 83-0049 and up, the engine rpm indicators are also powered in this position. In the event of a complete electrical failure, an attempt to restore the emergency generator may be made by cycling the switch to ISOLATE and back to MAN.

JFS GENERATOR

The JFS generator provides JFS ignition and control, and, with the JFS READY light on, intercom, utility light, and AMAD fire warning. These items are powered by the JFS generator until shutdown. If the JFS start switch is used for shutdown, the AMAD fire warning remains powered for a short time during JFS rundown.

EXTERNAL ELECTRICAL POWER

External electrical power may be connected to the aircraft through an external electrical power receptacle near the nose gear wheelwell. The aircraft buses are energized by external power in the same manner as if a main generator were operating. The exceptions to this are those buses which furnish power to systems which do not have on-off control switches and/or require cooling air. Power can be applied to these buses by the use of ground power switches. With external power on the airplane, if the left engine is started first, the complete electrical system automatically switches to internal power when the left generator comes on the line. If the right engine is started first, the right generator, when it comes on the line, energizes only the buses it normally feeds. The buses normally energized by the left generator remain on external power (except those buses energized by the JFS generator) until the external power is removed or the left engine is started and the left generator comes on the line.

External Power Control Switch

The external power control switch, on the engine control panel, controls application of external power to the aircraft electrical buses. An external power monitor will prevent faulty external power from being connected to the aircraft system.

NORM	Allows the aircraft electrical buses to be energized by external power if no aircraft generators are operating.
RESET	Will establish external power if it is not on the line. The RESET position is spring-loaded to NORM.
OFF	Disconnects external power from the aircraft.

Ground Power Switches

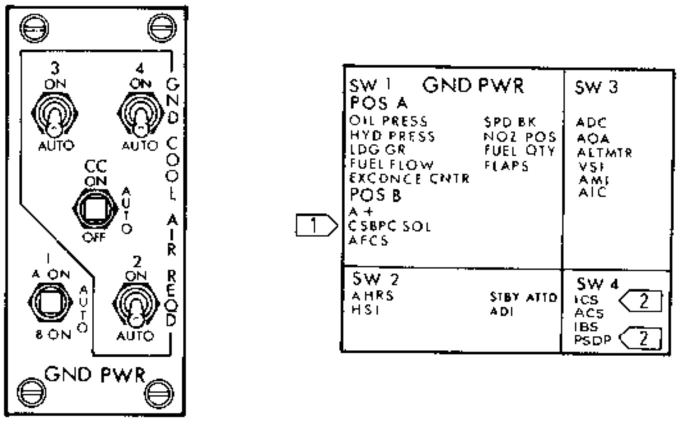
Five ground power switches are provided on the ground power panel (figure 1-5) on the left console. Each controls a group of systems and/or instruments and will prevent unnecessary operation of the systems/instruments on ground power. Switches 2, 3 and 4 have two positions, the CC switch and switch 1 have three.

AUTO	System/instrument can only be energized by aircraft generator power.
ON	System/instrument can be energized by external or generator power.
OFF	CC only is de-energized regardless of power source.

NOTE

With the ECS caution light on because of a low avionics cooling air flow condition, ground power switches 2, 3, 4 and CC become inoperative as a means of applying external power to their applicable equipment. Should any of the above switches be engaged in the ON position when a low avionics cooling air condition occurs, the switch(es) will remain in the ON position although the power to their equipment will be shut off.

GROUND POWER CONTROL PANEL & PLACARD



1 REMOVED F-15A AIRCRAFT 73-093 AND UP, AND F-15B AIRCRAFT 73-112 AND UP.

2 AFTER TO 1F-15-655

15A 1-11221D

Figure 1-5

Boost System Malfunction Light

The BST SYS MAL light, on the caution light panel, comes on when the emergency generator is on (single generator failure, etc.) and there is insufficient emergency boost pump output pressure or when the boost pump is powered by an abnormal source.

CIRCUIT BREAKERS

Circuit breakers for the AFCS, pitot heat, speed brake, flaps, landing gear, and nosewheel steering are provided on the lower center instrument panel.

HYDRAULIC POWER SUPPLY SYSTEM

Hydraulic power is supplied by three separate systems with each system divided into two or more circuits. Reservoir level sensing (RLS) is employed in all three systems for the purpose of isolating a leak. When a leak develops in a circuit a valve senses the reservoir level and shuts off the affected circuit. Through this method the maximum number of circuits remain operable. Refer to Hydraulic Flow Diagram, section III and the hydraulic systems foldout for a description of what each system powers.

PC SYSTEMS

PC1 pump and PC2 pump operate at a pressure of 3000 psi. Each PC system is divided into a circuit A and a circuit B.

UTILITY SYSTEM

The utility system has a left pump which operates at a pressure of 3000 psi and a right pump which operates at a pressure of 2775 psi. The utility system is divided into a circuit A, circuit B, and a non-RLS circuit.

RESERVOIR LEVEL SENSING

If a leak occurs in any circuit, the reservoir level of that system (PC1, PC2 or utility) drops and circuit A is shut off. If the leak is in circuit B the reservoir level continues to drop causing circuit A to be restored and circuit B is shut off. In the case of the utility system with a non-RLS circuit leak, circuit A is shut off then restored as circuit B is shut off; however, if flight is continued, a complete utility failure will eventually occur as indicated by zero pressure on the utility hydraulic gage.

HYDRAULIC PRESSURE INDICATORS

Three hydraulic pressure gages on the upper right corner of the instrument panel display PC1, PC2 and utility hydraulic system pressures.

HYDRAULIC SYSTEMS CAUTION LIGHTS

An amber HYDRAULIC light on the caution light panel and the MASTER CAUTION light come on when any hydraulic systems caution light on the BIT panel comes on. PC1 A, PC1 B, PC2 A, PC2 B, UTL A and UTL B lights on the BIT panel come on when their respective RLS valve actuates to shut off that circuit. The L PMP or R PMP light comes on when the respective utility hydraulic pump output pressure is low. An indication of a PC pump failure or low pressure is illumination of both the A and B bit lights for that system. When the HYDRAULIC light is illuminated resetting the MASTER CAUTION light also resets the HYDRAULIC light.

LANDING GEAR SYSTEM

The gear is electrically controlled and hydraulically operated. While weight is on the gear, the gear cannot be retracted. When the main and nose gear are extended, the forward door(s) will be closed.

LANDING GEAR CONTROL HANDLE

The landing gear is controlled by a wheel shaped handle located on the lower left side of the main instrument panel, and has two positions.

DOWN	Extends landing gear.
UP	Retracts landing gear.

Landing Gear Warning Light/Warning Tone

A red warning light in the landing gear control handle will illuminate when any landing gear is not locked in the selected position. In addition, after TO 1F-15A-791, a warning tone will be activated ten seconds after the landing gear control handle is placed down and will remain activated until all gear are down and locked. The red warning light will also illuminate due to an unlocked gear door when the landing gear control handle is up. This light is independent of the three green landing gear position lights. The light will illuminate and the warning tone will sound whenever the following conditions exist simultaneously: aircraft altitude is below 10,000 feet, airspeed is below 200 knots, rate of descent greater than 250 fpm and the gear handle is not down. In addition, the light will illuminate and a warning tone will sound when the Air Data Computer becomes inoperative, regardless of altitude, airspeed, or rate of descent. The warning tone may be silenced by depressing the warning tone silence button adjacent to the landing gear control handle. If the landing gear is up and locked and then the landing gear control circuit power fails (e.g., circuit breaker popped), the warning light will illuminate; however, the warning tone will not come on.

Landing Gear Position Lights

There are three green landing gear position lights located above the landing gear control handle marked NOSE, LEFT, and RIGHT. Each light will illuminate when its respective gear is down and locked.

EMERGENCY LANDING GEAR HANDLE

Emergency gear extension is accomplished by pulling the EMERG LG handle on the left main instrument panel. This bypasses normal hydraulic and electrical controls and hydraulically (JFS accumulator) releases the doors and landing gear. The landing gear then free falls to the down and locked position. The landing gear doors will remain open. The emergency landing gear handle must be rotated 30° clockwise and pushed in to reset.

NOSE GEAR STEERING SYSTEM

Nose gear steering is a full time mechanically controlled (rudder pedals) hydraulically powered (UTL A pressure) system that features dual authority steering ranges consisting of a normal (15° minimum left or right) range and a maneuvering (45° left or right) range. The steering system automatically engages whenever the nose gear strut is compressed by the weight of the aircraft and provides normal steering authority range. The maneuvering range is selected by pressing the nose gear steering button on the control stick. The nose gear steering system may be disengaged by pressing and holding the paddle switch on the control stick. With the system disengaged, the nose wheel becomes free swivelling and may be rotated 360°. When the paddle switch is released, the system will not re-engage with the nose gear rotated more than approximately 45°. During taxi, when centering action reduces the angle below approximately 45°, the nose gear steering system will re-engage. On takeoff, nose gear steering is disengaged when the nose gear strut extends.

EMERGENCY STEERING

Emergency power for the nose gear steering is selected by pulling the emergency brake/steering handle located on the lower center of the main instrument panel. Pulling the handle selects JFS hydraulic accumulator pressure to power the nose gear steering. With the emergency brake/steering handle pulled, both nose gear steering ranges are available and cannot be disengaged with the paddle switch. If UTL A is operating, the nose gear steering may not shift to the JFS hydraulic accumulator pressure or may only partially shift which can cause loss of, or reduced steering rate (sluggish) that may appear as loss of steering. Pressing and holding the paddle switch will remove UTL A from the system and ensure that the nose gear steering shifts fully to JFS hydraulic accumulator pressure. If UTL A is available the normal steering system can be restored by resetting the emergency brake/steering handle and releasing the paddle switch. If the JFS LOW light is on, the emergency steering system is not reliable for taxi since accumulator pressure can no longer be monitored.

EMERGENCY BRAKE/STEERING HANDLE

For location and use of the emergency/brake steering handle, refer to Emergency Steering and Emergency Brakes narrative this section.

BRAKE SYSTEM

The main landing gear wheels are equipped with hydraulic powered brakes operated by toe action on the rudder pedals. An anti-skid system is incorporated in the normal brake system to provide maximum deceleration with controlled wheel skid. An emergency brake system provides JFS hydraulic accumulator pressure to power the brake system in the event of loss of UTL A which normally powers the system. Anti-skid protection is not available on the emergency brake system.

ANTI-SKID SYSTEM

The anti-skid system is electrically controlled by a three position switch on the miscellaneous control panel located on the forward portion of the left console. An ANTI-SKID light on the caution light panel and the MASTER CAUTION light will come on whenever the landing gear is down and a system failure is detected. A touchdown protection circuit (with anti-skid ON) prevents hydraulic pressure from being applied to the brakes until both main wheels spin up. Skid control effectiveness deteriorates below 30 knots; therefore, heavy braking below 30 knots may result in locked wheels. After touchdown, the ARI will be disengaged by the anti-skid wheel spin up signal. With the anti-skid switch OFF, ARI will be disengaged anytime the landing gear handle is down.

On aircraft before TO 1F-15-791, if all landing gear position lights are inoperative (gear are confirmed down) but the lights test good, the anti-skid system will be inoperative and there will be no MASTER CAUTION or ANTI-SKID light to warn of the loss. If the lights do not test good, the anti-skid system should be available; however, warning of subsequent anti-skid failure may or may not be available. If the gear operated normally but the left gear light only is out, anti-skid is operative but a warning of subsequent failure is not available. Finally, on aircraft before TO 1F-15-791, if the landing gear control circuit breaker is out (cockpit pedestal), the anti-skid system may become inoperative during hard braking (due to strut flexing causing jury link switches to open) and this loss would occur without warning. When the anti-skid is inoperative and for some anti-skid detected malfunctions, the ARI will remain engaged at wheel spin-up, adversely affecting crosswind landing characteristics. Turning the anti-skid switch OFF/PULSER will ensure ARI disengagement.

NORM	The anti-skid is on when gear handle is down.
OFF	The anti-skid and ARI are off when gear handle is down.

Brake Pulser System

After TO 1F-15-763 a Brake Pulser System provides main tire skid control in the event anti-skid braking is not available. The pulser brake system is automatically selected whenever the ANTI-SKID light illuminates and anti-skid is selected. The pulser may also be selected manually by use of the three position anti-skid switch. When the pulser system is activated, applied brake pressure is repeatedly interrupted to the wheel brakes. This provides a pulsating braking action which reduces the probability of tire blow-out from locked wheels. This also prevents bringing the aircraft to a complete stop on the brake pulser system. After TO 1F-15-791, the MASTER CAUTION light and ANTI-SKID light do not depend on the position of the landing gear circuit breaker. However, if the landing gear circuit breaker is pulled or popped, the automatic selection of the brake pulser system is disabled and PULSER must be manually selected in order to obtain pulser and disengage ARI.

NORM	The anti-skid is on when the gear is down. However, illumination of the ANTI-SKID warning light activates the brake pulser system and ARI is disengaged with the gear down.
PULSER	Turns off normal anti-skid protection, turns on the ANTI-SKID and MASTER CAUTION lights, and activates the brake pulser system. The ARI is disengaged with the gear handle down.
OFF	Turns off the normal anti-skid and brake pulser systems. Disengages ARI with the gear handle down.

EMERGENCY BRAKE SYSTEM

Emergency brake system pressure is supplied by the JFS accumulator and actuated by pulling the emergency brake/steering handle. If UTL B is operating, the accumulator will be continuously replenished. If not, sufficient braking should be available to stop the aircraft. Emergency brakes may feel more sensitive than normal brakes because anti-skid protection is not available. If UTL A pressure is available, the normal brake system can be restored by resetting the emergency brake/steering handle.

ARRESTING HOOK SYSTEM

A retractable arresting hook is in the underside of the aft fuselage. It is electrically controlled, extended by gravity and a hydraulic dashpot, and retracted by utility hydraulic pressure.

Arresting Hook Switch

An arresting hook control switch is a two position switch located on the left sub panel.

UP	Hook is retracted.
DOWN	Hook is extended.

Arresting Hook Light

The HOOK light is on the caution light panel. Anytime the arresting hook is not up and locked the MASTER CAUTION and HOOK light come on.

FLAP SYSTEM

Each wing has a two position trailing edge flap. The flaps are electrically controlled and hydraulically operated. When the flaps are down, they are protected from structural damage by a blow up airspeed switch. The switch is set to automatically retract the flaps at approximately 250 knots. At approximately 240 knots, the flaps will automatically return to the down position, providing the flap control switch is in the down position.

Flap Control Switch

The flap control switch is a two position switch located on the throttle quadrant.

UP	Retracts the flaps.
DOWN	Extends the flaps.

Flap Position Lights

The flap position lights are on the left sub panel. The YELLOW light indicates the flaps are in transit. A GREEN light indicates the flaps are down.

SPEED BRAKE SYSTEM

A speed brake is located on the upper surface of the center fuselage just aft of the canopy. It is electrically controlled and hydraulically operated. The speed brake can be positioned to any intermediate position between fully retracted and fully extended with AOA below approximately 25 units. If AOA is above 25 units, the speed brake will not extend when selected. If the speed brake is extended, it will automatically retract, when AOA increases through 25 units. Following automatic retraction of the speed brake, when AOA is reduced, the speed brake will automatically extend provided the speed brake switch is in the OUT position.

Speed Brake Switch

The speed brake switch has three positions and is located on the inboard throttle. The switch will remain in any selected position.

CENTER DETENT	Stops the speed brake in any intermediate position.
AFT DETENT	Extends the speed brake.
FORWARD DETENT	Retracts the speed brake.

Speed Brake Out Light

The SPD BK OUT light located on the caution light panel illuminates when the speed brake is in the extended or partially extended position. The MASTER CAUTION light will not illuminate when the speed brake light illuminates.

FLIGHT CONTROL SYSTEM

The aircraft primary flight control surfaces consist of conventional ailerons, twin rudders, and stabilators, which are capable of symmetrical or differential movement. Hydraulic actuators are used to position the control surfaces. The inputs to the hydraulic actuators are from a hydromechanical system and an electrical system called the control augmentation system (CAS). The hydromechanical system and the CAS normally work together, but either system alone is capable of providing sufficient aircraft control for flight. Spring cartridges provide simulated aerodynamic forces to the control stick and rudder pedals. The spring cartridges have trim actuators which actually move the neutral positions and thus the control surfaces. Refer to foldout section for the flight control schematic.

Control Stick

The control stick (figure 1-6) consists of a stick grip and force transducer, and contains six controls: an autopilot/nose gear steering disengage switch (paddle switch), nose gear steering button, a trigger, a weapon release button, a trim switch and auto acquisition button. The trigger, weapon release button, and auto acquisition button are described in TO 1F-15A-34-1-1 or TO 1F-15C-34-1-1; the other controls are described in their various sections.

CONTROL STICK

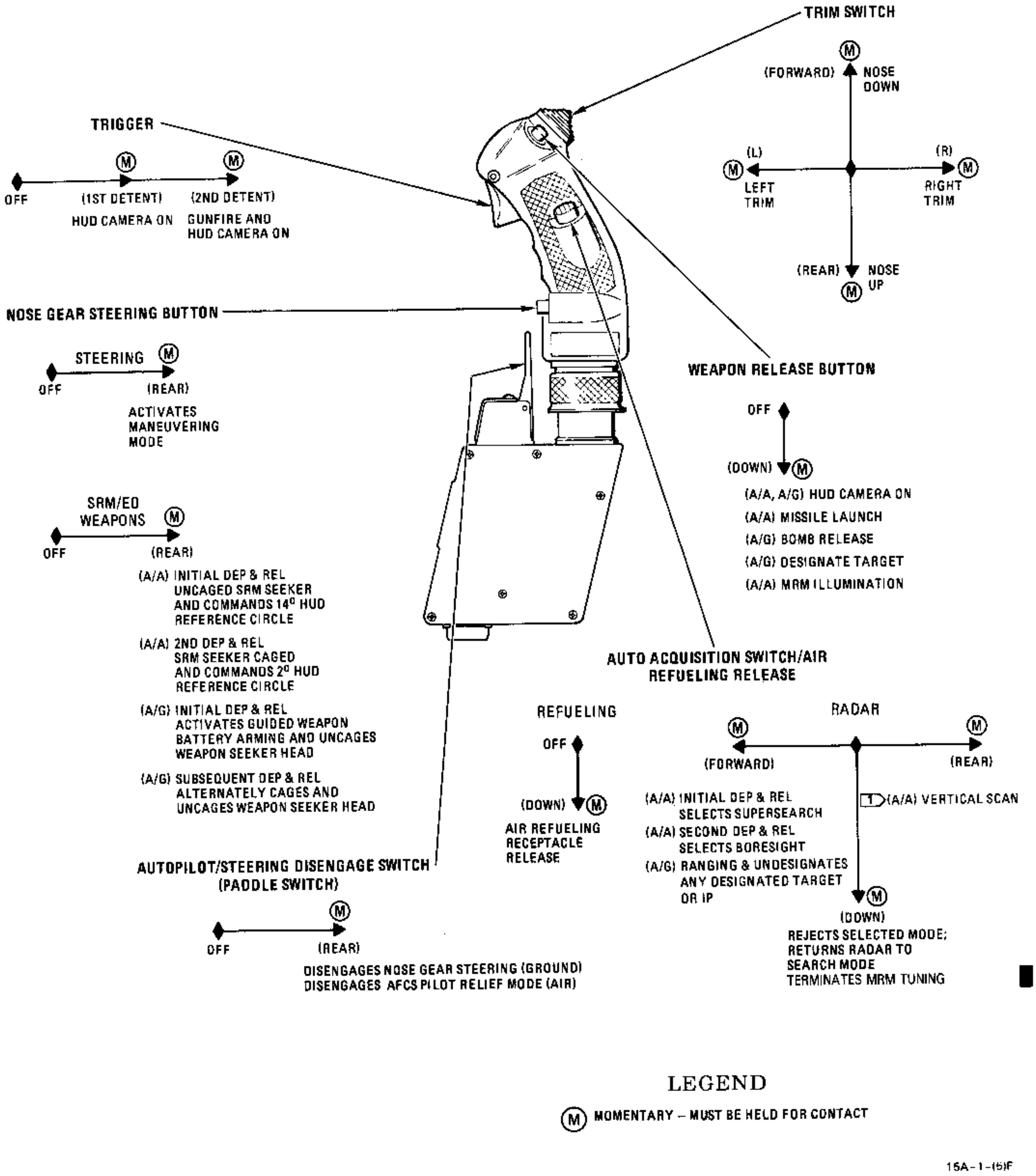

TRIM SWITCH
(M)
(FORWARD) NOSE DOWN
(L) (M) LEFT TRIM
(R) (M) RIGHT TRIM
(REAR) NOSE UP (M)
TRIGGER
(M) (M)
OFF (1ST DETENT) (2ND DETENT)
HUD CAMERA ON
GUNFIRE AND HUD CAMERA ON
NOSE GEAR STEERING BUTTON
STEERING (M)
OFF (REAR)
ACTIVATES MANEUVERING MODE
SRM/EO WEAPONS (M)
OFF (REAR)
(A/A) INITIAL DEP & REL UNCAGED SRM SEEKER AND COMMANDS 14° HUD REFERENCE CIRCLE
(A/A) 2ND DEP & REL SRM SEEKER CAGED AND COMMANDS 2° HUD REFERENCE CIRCLE
(A/G) INITIAL DEP & REL ACTIVATES GUIDED WEAPON BATTERY ARMING AND UNCAGES WEAPON SEEKER HEAD
(A/G) SUBSEQUENT DEP & REL ALTERNATELY CAGES AND UNCAGES WEAPON SEEKER HEAD
AUTOPILOT/STEERING DISENGAGE SWITCH (PADDLE SWITCH)
(M)
OFF (REAR)
DISENGAGES NOSE GEAR STEERING (GROUND)
DISENGAGES AFCS PILOT RELIEF MODE (AIR)
WEAPON RELEASE BUTTON
OFF
(DOWN) (M)
(A/A, A/G) HUD CAMERA ON
(A/A) MISSILE LAUNCH
(A/G) BOMB RELEASE
(A/G) DESIGNATE TARGET
(A/A) MRM ILLUMINATION
AUTO ACQUISITION SWITCH/AIR REFUELING RELEASE
REFUELING
OFF
(DOWN) (M)
AIR REFUELING RECEPTACLE RELEASE
RADAR
(M) (M)
(FORWARD) (REAR)
(A/A) INITIAL DEP & REL SELECTS SUPERSEARCH
(A/A) SECOND DEP & REL SELECTS BORESIGHT
(A/G) RANGING & UNDESIGNATES ANY DESIGNATED TARGET OR IP
1 (A/A) VERTICAL SCAN
(M) (DOWN)
REJECTS SELECTED MODE; RETURNS RADAR TO SEARCH MODE
TERMINATES MRM TUNING
LEGEND
(M) MOMENTARY – MUST BE HELD FOR CONTACT
15A-1-(5)F

Figure 1-6

Rudder Pedals

The rudder pedals operate conventionally and are adjustable. The rudder pedals are also used for the brakes and nose gear steering.

Rudder Pedal Adjust Knob

Pulling the rudder pedal adjust knob located on the instrument panel releases both rudder pedals. The pedals are then forced aft by spring pressure or pushed forward by the pilot to achieve the desired adjustment.

T/O Trim Button and Light

The T/O trim button, on the CAS control panel, when pressed, drives the stick and rudder pedals to the takeoff position which, in turn, drives the aileron, rudder and stabilator actuators to the takeoff position. The T/O trim light will then come on. The departure warning tone will sound after the T/O trim button has been pressed and takeoff trim is within limits. The T/O trim light will go out and the tone will cease when the button is released. The stick takeoff position produces a slight nose up trim position which, in turn, drives the pitch trim compensator to the full nose up limit of its authority (stabilator leading edge down). This provides maximum nose up stabilator authority for takeoff. The pitch trim compensator will continue to drive the stabilator leading edge down after the button is released.

HYDROMECHANICAL FLIGHT CONTROL SYSTEM

The hydromechanical flight control system uses mechanical linkages and hydraulic actuators to position the flight control surfaces.

Longitudinal Control

Longitudinal stick motion positions the stabilators symmetrically to provide pitch control. The ratio of symmetrical stabilator motion to longitudinal stick motion (pitch ratio) is automatically adjusted for altitude and speed. This provides the same pitch response (constant g) for a given stick deflection regardless of airspeed. The ratio is high (greatest stabilator authority) at low speeds, and low at high speeds at low altitude. If hydraulic pressure is lost the pitch ratio will drive to an intermediate position and lock. If the mechanical linkage becomes jammed, mechanical longitudinal control is lost; however, the CAS can provide enough stabilator control for moderate flight maneuvers and landing.

Longitudinal Trim/Feel System

The longitudinal control system includes two types of trim control: a manual trim and an automatic trim. The manual trim is controlled by the pilot using the trim button on the stick. The manual trim actuator changes the neutral position of the longitudinal feel spring cartridge to reposition neutral stick position and thus neutral stabilator position. When airborne, the flight control system automatically trims the stabilator without affecting stick position to compensate for changes in trim caused by such things as changing speed, operating flaps or speed brake, or store separations. On the ground, the PTC slowly trims the stabilator to either the extreme forward or aft limit of its authority as the stick is positioned forward or aft of the neutral stick position. This stick positioning can take place by manual stick inputs or by manual trim.

Pitch Ratio Switch

The pitch ratio switch is on the main instrument panel.

AUTO	Provides normal system functions.
EMERG	Removes hydraulic pressure from the hydromechanical pitch control system which causes the pitch ratio and the pitch trim compensator (PTC) to drive to a midrange position and lock. Mechanical ARI is also disabled.

Pitch Ratio Indicator

The pitch ratio indicator on the main instrument panel shows the ratio of symmetrical stabilator motion to longitudinal stick motion. For a given stick motion, the stabilators move most at a pitch ratio of 1.0 and the least at zero. The ratio should be 1.0 at slow speeds and near zero at .9 mach near sea level. The indicator will show 0.4 if the pitch ratio switch is placed in EMERG or hydraulic pressure is lost.

Pitch Ratio Light

The PITCH RATIO light, on the caution light panel, comes on if hydraulic pressure is lost to the control stick boost/pitch compensator (CSBPC), the pitch ratio switch is in the EMERG position, or the pitch ratio versus airspeed is incorrect below 20,000 feet. However, with the gear down and airspeed above 220 knots the PITCH RATIO light may come on until the pitch ratio drives to above 0.9. This condition is normal and should be disregarded.

LATERAL CONTROL

Lateral stick motion positions the ailerons, rudders and stabilators to provide roll control. The ratio of aileron/differential stabilator deflection to lateral stick motion (roll ratio) is adjusted automatically for different airspeeds, longitudinal stick position and gear position. This provides the same roll response for a given stick deflection regardless of airspeed. Aileron and differential stabilator deflection are washed out to prevent adverse yaw when longitudinal stick deflection is combined with lateral stick deflection. At subsonic speeds, the roll ratio is high; at supersonic speeds the roll ratio is reduced. With the landing gear down, full aileron/differential stabilator is available at any longitudinal stick position. If UTL A and PC2A hydraulic pressures are lost or the roll ratio switch is in EMER, the roll ratio drives to mid-range and locks. A spin recovery aid provides full lateral control authority, regardless of longitudinal stick position, when the yaw rate exceeds 60° per second. Full lateral authority will be discontinued when the yaw rate is less than 60° per second.

The mechanical aileron-rudder interconnect (ARI) adjusts the control system such that lateral stick motion results in varying rudder deflection dependent on longitudinal stick position. With the control stick aft of neutral, lateral stick motion causes rudder deflection in the same direction as stick motion. With the control stick forward of neutral, lateral stick motion causes rudder deflection in the opposite direction of the stick motion. In addition, when the flaps are down, the amount of rudder deflection for lateral input is increased. The ARI is disengaged at supersonic speeds and on landing. If the anti-skid system detects a malfunction, or the landing gear circuit breaker is OUT, the ARI may remain engaged at wheel spin up, adversely affecting crosswind landing characteristics. Turning the anti-skid switch OFF or PULSER will insure ARI disengagement. If UTL A and PC2A hydraulic pressures are lost or either the Pitch or Roll Ratio switch is in EMER, the ARI is inoperative. If the mechanical system is inoperative, the differential stabilators (through roll CAS) will provide lateral control for moderate maneuvers including landing.

Lateral Trim/Feel System

The aircraft is trimmed laterally using the trim button on the stick. The trim actuator changes the neutral position of the lateral feel spring cartridge to reposition neutral stick position and thus neutral aileron/differential stabilator position.

Roll Ratio Switch

The roll ratio switch is on the miscellaneous panel.

AUTO	Provides normal system functions.
EMERG	Removes hydraulic pressure from the hydromechanical roll control system which causes the roll ratio to drive to a midrange and lock. Mechanical ARI is also disabled.

Roll Ratio Light

The ROLL RATIO light on the caution light panel comes on if hydraulic pressure is lost, the roll ratio switch is in EMERG, the landing gear control handle is DOWN without full roll authority available, or the landing gear control handle is UP with full roll authority available or if roll authority is not commanded to 2/3 of maximum roll authority above Mach 1.5. Presence of the ROLL RATIO light above Mach 1.5 also indicates the mechanical ARI has not been commanded to OFF.

YAW CONTROL

Rudder pedal motion positions the rudders to provide yaw control. If the rudder linkage jams, safety spring cartridges allow the rudder pedals to move to permit nose wheel steering. The rudders are still actuated through the CAS (CAS alone provides only about half rudder deflection). If the nose gear steering jams, similar devices permit rudder operations.

Yaw Trim/Feel System

The aircraft yaw is trimmed using the trim switch on the throttle quadrant. The trim actuator changes the neutral position of the rudder feel spring cartridges to reposition neutral rudder pedal position and also neutral rudder position.

Rudder Travel Limiter

The rudder travel limiter system is completely automatic. When aircraft speed reaches approximately 1.5 mach, rudder pedal movement is mechanically limited. As the airspeed decreases through 1.5 Mach, the limiter retracts and full rudder pedal movement is restored.

Rudder Travel Limiter Light

The RUDR LMTR light on the caution light panel comes on when the rudder pedal limiter is not engaged above 1.5 Mach or is engaged below 1.5 Mach.

AOA TONE

A beeping tone sounds at approximately 30 units AOA. The tone sounds only when the landing gear is down. The beep rate increases as AOA increases. The tone may be eliminated only by decreasing AOA.

DEPARTURE WARNING

With the landing gear up, a beeping tone (lower pitched than the AOA tone) sounds when the yaw rate reaches 30° per second. As the yaw rate increases the beep rate increases. The tone reaches a maximum beep rate at 60° per second yaw rate. The tone sounds with the T/O trim button depressed and the T/O trim light on. The T/O trim beep rate correlates to approximately 45° per second yaw rate.

AUTOMATIC FLIGHT CONTROL SYSTEM (AFCS)

The AFCS provides the following functions: pitch, roll and yaw control augmentation (CAS), autopilot modes of pitch/roll attitude and altitude hold.

CONTROL AUGMENTATION SYSTEM (CAS)

Superimposed on the hydromechanical flight control system is a dual channel, three axes control augmentation system (CAS). The CAS responds to electrical signals generated by forces applied to the control stick and to rudder pedal position. These signals modify the control surface deflections commanded by the hydromechanical flight control system to provide the desired flying qualities. The CAS also provides increased dampening on all three axes. Since CAS inputs are applied directly to the actuator and the inputs are due to force and require no control motion, with the CAS on, the aircraft is fully controllable with the loss of any or all mechanical linkages. The dual channel design turns any axis off when a failure occurs. The CAS affects stabilator and rudder position only, the ailerons are not controlled by the CAS. A moderate yaw transient may occur and is normal when yaw CAS is disengaged, reengaged, or the landing gear is lowered.

CAS Lights

Three CAS lights (CAS YAW, CAS ROLL, and CAS PITCH), on the caution light panel, come on any time their respective axis is disengaged by a failure in the CAS system or the switch is off. Any time the pitch or yaw CAS disengages, the roll CAS also disengages. A moderate yaw transient may occur and is normal when yaw CAS is disengaged or engaged. If the roll CAS is functioning normally, it can be re-engaged following the loss of pitch CAS. Roll CAS cannot be engaged without an operating yaw CAS.

CAS Switches

The following three positions are applicable to the roll, pitch, and yaw CAS switches.

ON	Allows normal operation after engagement.
RESET	Engages disconnected axis (provided fault no longer exists). The switch is spring loaded from RESET to ON.
OFF	Disengages applicable axis.

AUTOPILOT MODES

All three CAS axes must be engaged and operating satisfactorily to engage the two autopilot modes, pitch/roll attitude and altitude hold.

Pitch/Roll Attitude Hold

Attitude hold is engaged by placing the attitude hold switch on the CAS control panel to ON. Attitude hold will automatically be disengaged and the attitude hold switch will remain in the ON position when the pitch attitude is greater than ±45°, or the roll attitude is greater than ±60°, or control stick steering (CSS) is in effect. Control stick steering will be engaged and roll attitude hold will be disengaged when a lateral force is applied, and pitch attitude hold will be disengaged when a longitudinal force is applied to the control stick. When stick forces are relaxed, CSS is disengaged, attitude hold is re-engaged, and the aircraft will hold the attitude that existed upon re-engagement. When one of the following conditions exist attitude hold will be disengaged and attitude hold switch will physically move to the OFF position: load factor is greater than +4g or less than 0g, INS attitude signals are not valid, a CAS axis is disengaged (manually or by a fault monitor), the emergency quick release lever is depressed, or the attitude hold switch is manually moved to OFF. To re-engage pitch/roll attitude hold the switch must be placed back to the ON position.

Altitude Hold

The attitude hold switch must be on before the altitude hold switch can be engaged. Altitude hold is engaged by placing the altitude hold switch, on the CAS control panel, to ON. The altitude at the time of engagement is the reference altitude. If the pitch (CSS) is in effect, roll attitude is greater than ±60°, altitude hold disengages and the altitude hold switch will remain in the ON position. When stick forces are relaxed, CSS is disengaged, and the aircraft will hold the altitude at re-engagement. When one of the following conditions exist altitude hold will be disengaged and altitude hold switch will physically move to the OFF position: an ADC or INS failure, ATT HOLD disengages, vertical velocity exceeds 2000 ft/min. or the altitude hold switch is physically moved to OFF. To re-engage altitude hold the switch must be placed back to the ON position.

AUTOPILOT DISENGAGE LIGHT

An AUTO PLT disengage light, on the caution light panel, comes on when the AFCS and/or altitude hold disengages. Pressing the MASTER CAUTION light resets the AUTO PLT disengage light.

PITOT-STATIC SYSTEM

The pitot-static system (figure 1-7) employs multiple pitot and static sources for redundancy and to provide each inlet controller with conditions peculiar to its inlet during asymmetric conditions. There is an airstream pitot-static mast on each side of the forward fuselage and a pitot mast and flush static port in each inlet duct.

PITOT HEAT SWITCH

The pitot heat switch is on the ECS panel on the right console. Two circuit breakers are available to the pilot.

ON	Provides electrical power to the heating elements of all four pitot-static probes.

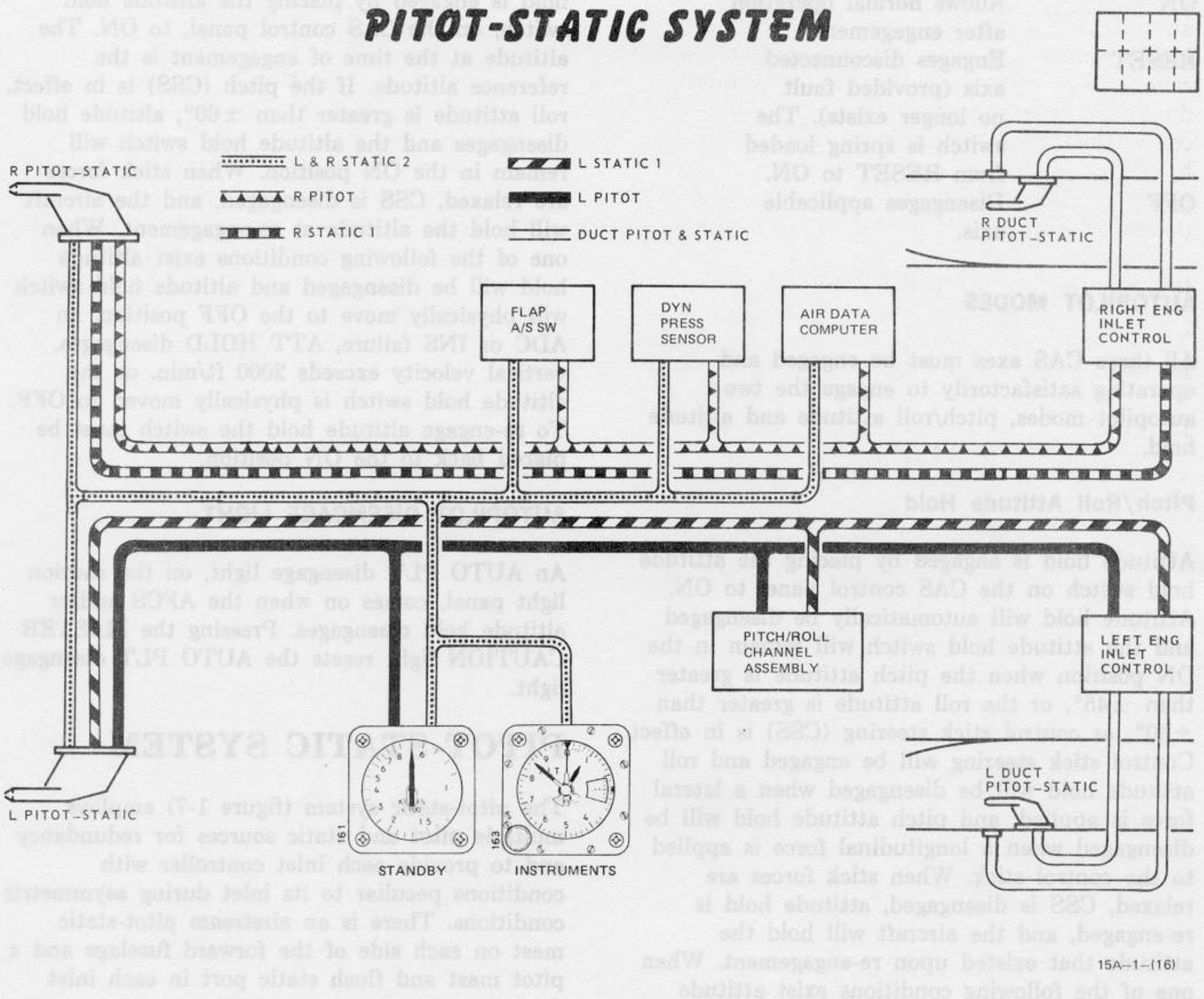

PITOT-STATIC SYSTEM

Figure 1-7

BOARDING STEPS

A boarding steps position indicator on the left canted bulkhead will display UP when the steps are retracted and DOWN when the steps are extended.

CANOPY SYSTEM

The cockpit area is enclosed by a clamshell type canopy. Refer to foldout section for ejection seat illustration. The main components of the canopy system are a hydraulic actuator which provides manual and powered operation of the canopy, a locking mechanism, and a pyrotechnic canopy remover for emergency jettison. Latches on the canopy frame and along the lower edge of the canopy engage fittings on the cockpit sill structure to lock the canopy to the fuselage. An inflatable seal, installed around the edge of the canopy frame, retains cockpit pressure when the canopy is locked.

NORMAL CANOPY SYSTEM

For normal canopy operation, the internal canopy control handle (figure 1-8) is provided on the right side of the cockpit under the canopy sill.

For operation of the canopy from outside the aircraft, an external canopy control handle is located on the left side of the aircraft below the canopy. The external canopy control handle duplicates operation of the internal canopy control handle. An accumulator provides hydraulic power for powered operation of the canopy (2-1/2 to 3 cycles) when utility hydraulic pressure is not on the aircraft.

Internal Canopy Control Handle

The canopy control handle has four positions: LOCKED, DN, HOLD and UP.

LOCKED	Causes a hydraulic block, therefore it is necessary to have the canopy against the windscreen before placing the handle in LOCKED. An interlock is installed to prevent (once the canopy contacts the canopy sill) moving the handle from DN to LOCKED until the canopy locking cycle is completed.
UP	Raises canopy to maximum open position. If selected from the LOCKED position, the canopy will first unlock, then move 1.5 inches aft before rising.
DN	Lowers canopy full down, then forward against the windscreen. The canopy is then hydraulically locked.
HOLD	Creates a hydraulic lock and stops the canopy at any point in the open or close cycle. This position may be used when the canopy is to be left open for an extended period.

External Canopy Control Handle

The external canopy control handle (figure 1-8) is normally stowed flush with the fuselage on the left side of the aircraft below the canopy. When the handle retaining pushbutton is pushed, the handle springs outboard approximately 2 inches from the fuselage. After rotating the handle full aft to the UP position, canopy will move slightly aft and start opening. To stop the canopy at any point in its opening travel rotate the handle slightly forward from the full aft position to the HOLD position. To close the canopy rotate the handle forward to the DOWN position. The DOWN position also locks the canopy. The LOCKED position produces a hydraulic block in the canopy system. The handle is stowed flush with the fuselage by manually pushing inboard until the retaining latch is engaged.

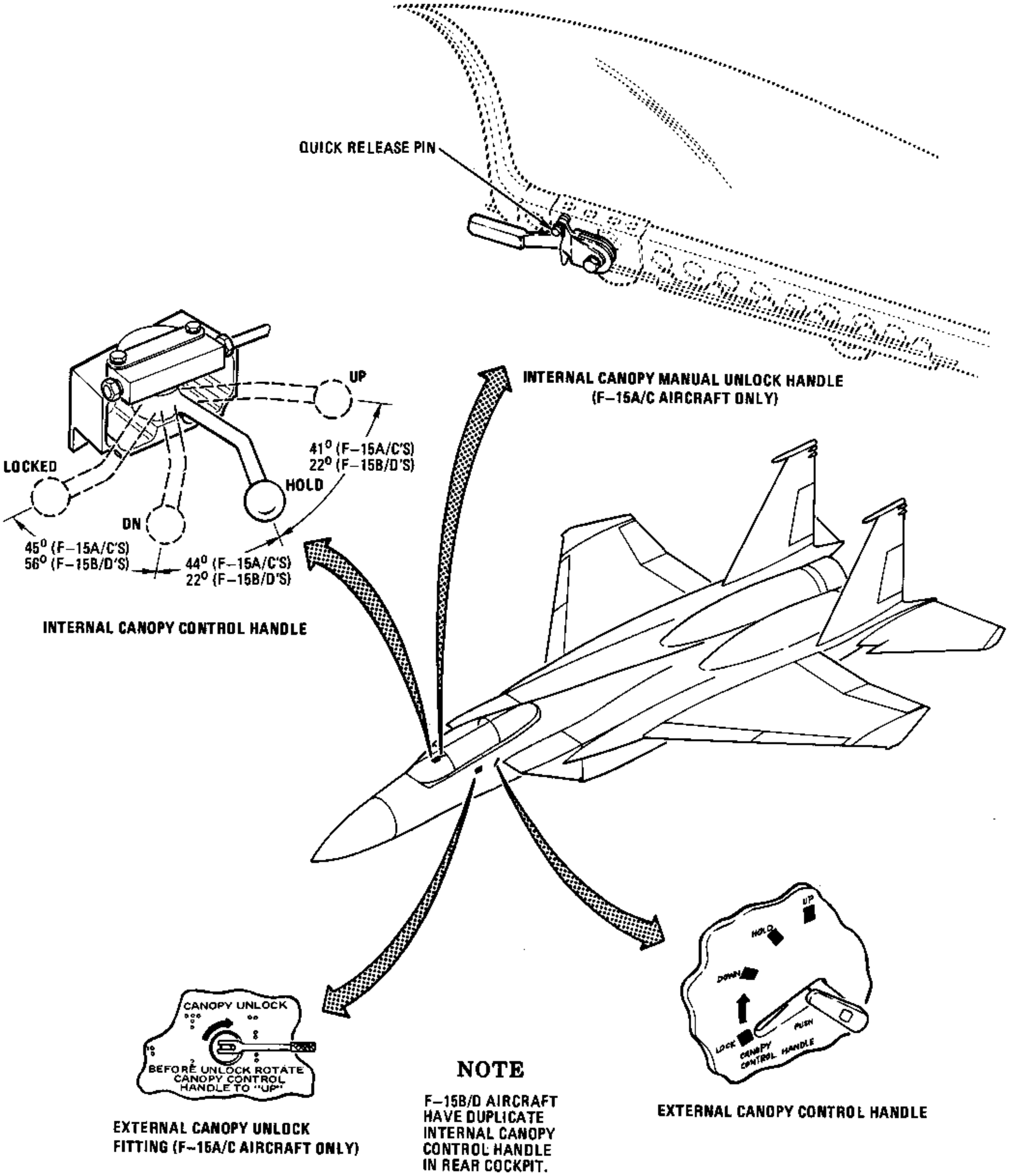
Internal Canopy Manual Unlock Handle

An internal canopy manual unlock handle, on the right canopy frame just aft of the canopy leading edge, is provided to unlock the canopy manually in case of loss of hydraulic pressure to the canopy system. Rotating the handle aft permits the canopy to be forced aft and up. Before rotating, a quick release pin in the handle must be removed and the internal canopy control handle must be positioned to UP.

External Canopy Unlock Fitting

An external canopy unlock fitting, below the left canopy frame and forward of the external canopy control handle, is provided for manually unlocking the canopy from the outside of the aircraft. In case of loss of hydraulic pressure to the canopy system, the canopy can be unlocked by inserting a 0.5 inch square drive tool into the fitting and then rotating clockwise. Before utilizing the external canopy unlock fitting, either the internal canopy control handle or the external canopy control handle must be in the UP position. After the canopy is unlocked, the canopy must be forced aft and up in order to open.

CANOPY CONTROL HANDLES AND FITTINGS


QUICK RELEASE PIN
INTERNAL CANOPY MANUAL UNLOCK HANDLE
(F–15A/C AIRCRAFT ONLY)
UP
LOCKED
41° (F–15A/C'S)
22° (F–15B/D'S)
HOLD
DN
45° (F–15A/C'S)
56° (F–15B/D'S)
44° (F–15A/C'S)
22° (F–15B/D'S)
INTERNAL CANOPY CONTROL HANDLE
CANOPY UNLOCK
BEFORE UNLOCK ROTATE CANOPY CONTROL HANDLE TO "UP"
EXTERNAL CANOPY UNLOCK FITTING (F–15A/C AIRCRAFT ONLY)
UP
HOLD
DOWN
LOCK
CANOPY CONTROL HANDLE
PUSH
EXTERNAL CANOPY CONTROL HANDLE

NOTE

F–15B/D AIRCRAFT HAVE DUPLICATE INTERNAL CANOPY CONTROL HANDLE IN REAR COCKPIT.

15A–1–(97)F

Figure 1-8

Canopy Unlocked Warning Light

The CANOPY UNLOCKED warning light on the upper right of the instrument panel comes on whenever the canopy is unsafe for flight.

Canopy Actuated Initiator Firing Indicator

The canopy actuated initiator firing indicator is located on the bulkhead in back of the seat. The indicator is a gray cylinder-like housing containing an orange spiral spring which extends when the canopy actuated initiator is fired. Refer to foldout section, Ejection Seat Illustration.

EMERGENCY CANOPY SYSTEM

For canopy jettison, a pyrotechnic canopy remover operates independently of the normal canopy system. The canopy remover is designed to safely jettison the canopy only from the closed and LOCKED position. When the ejection control handle, or either internal or external canopy jettison handle is pulled, the remover mechanically unlocks and jettisons the canopy. Improperly placed or unsecured items near the canopy remover may actuate the canopy jettison bellcrank causing loss of the canopy.

Canopy Jettison Handle

A black and yellow striped canopy jettison handle is located under the left canopy sill just aft of the instrument panel. Depressing an unlock button on the inboard side of the handle, and pulling the handle aft fires the canopy jettison system. The handle, once pulled to the fired position, is locked in the fired position where it remains locked until the handle and initiator are replaced.

External Canopy Jettison Handle

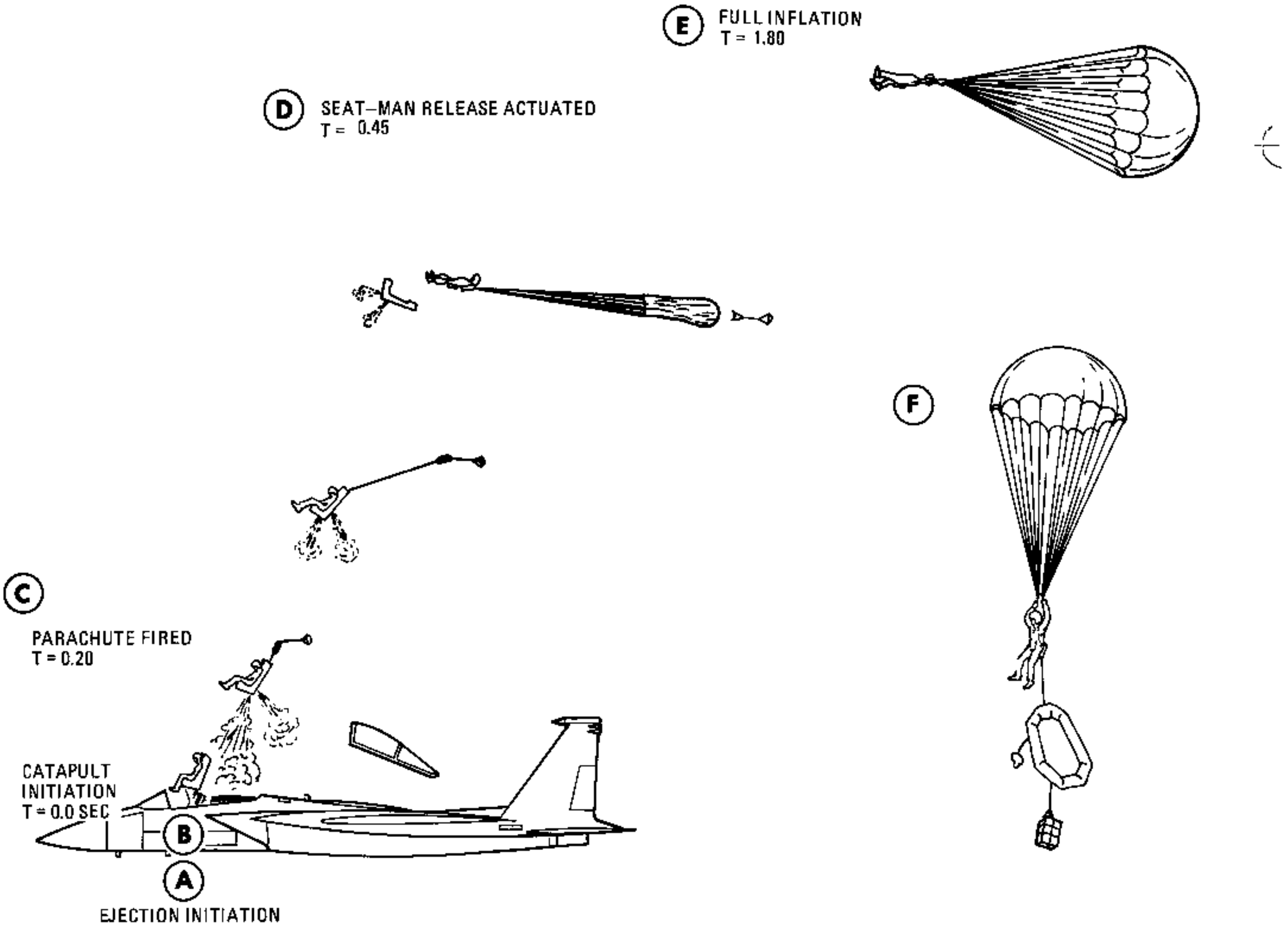
The external canopy jettison handle is a T-handle located within an access door just below and forward of the external canopy control handle, and is used to jettison the canopy from outside the aircraft (refer to Airplane Entry/Aircrew Extraction, section III). After pushing a release button to open the access door, the handle and its lanyard is played out 8 feet from the aircraft and then pulled. This fires the external canopy jettison system.

EJECTION SEAT SYSTEM

The ejection seat is a fully automatic catapult rocket system. Refer to foldout section for ejection seat illustration. Three ejection modes are automatically selected. Refer to figure 1-9. Mode 1 is a low speed mode during which the parachute is deployed almost immediately after the seat departs the aircraft; Mode 2 is a high speed mode during which a drogue chute is first deployed to slow the seat, followed by the deployment of the parachute; Mode 3 is a high altitude mode in which the sequence of events is the same as mode 2 except that man-seat separation and deployment of the parachute is delayed until a safe altitude is reached. Controls are provided to adjust seat height and lock shoulder harness.

ACES II EJECTION SEQUENCES

MODE 1 OPERATION 150 KNOTS


E FULL INFLATION T = 1.80
D SEAT–MAN RELEASE ACTUATED T = 0.45
F
C PARACHUTE FIRED T = 0.20
CATAPULT INITIATION T = 0.0 SEC
B
A EJECTION INITIATION

- **(A)** EJECTION CONTROL HANDLE PULLED TO ACTUATE SEAT–MOUNTED GAS INITIATOR AND:
  - POWERED INERTIA REEL RETRACTS SHOULDER STRAPS
  - CANOPY REMOVER FIRES.
  - CANOPY JETTISONS AND PULLS LANYARD TO FIRE CANOPY ACTUATED INITIATOR.
  - IFF SWITCH ACTUATED.
- **(B)** ROCKET CATAPULT FIRES, SEAT MOVES UP RAILS AND:
  - RECOVERY SEQUENCER POWER SUPPLY ENERGIZED.
  - COMMUNICATIONS AND SHIPS OXYGEN LINES DISCONNECT.
  - EMERGENCY OXYGEN IS TRIPPED.
  - RECOVERY SEQUENCER SWITCH TRIPPED BY STRIKER PLATE.
  - STAPAC PITCH CONTROL SYSTEM INITIATED.
- **(C)** PARACHUTE DEPLOYMENT MORTAR FIRES AS SEAT CLEARS AIRCRAFT.
- **(D)** RECOVERY SEQUENCER INITIATES HARNESS RELEASE ACTUATOR AND:
  - A. LAP BELT AND SHOULDER HARNESS STRAPS RELEASE FROM SEAT STRUCTURE.
  - B. PILOT IS SEPARATED FROM SEAT.
  - C. RADIO BEACON INITIATED (IF AUTO SELECTED).
- **(E)** PARACHUTE FULLY INFLATED
- **(F)** SURVIVAL KIT DEPLOYED (PROVIDED AUTO SELECTED ON DEPLOYMENT SELECTOR

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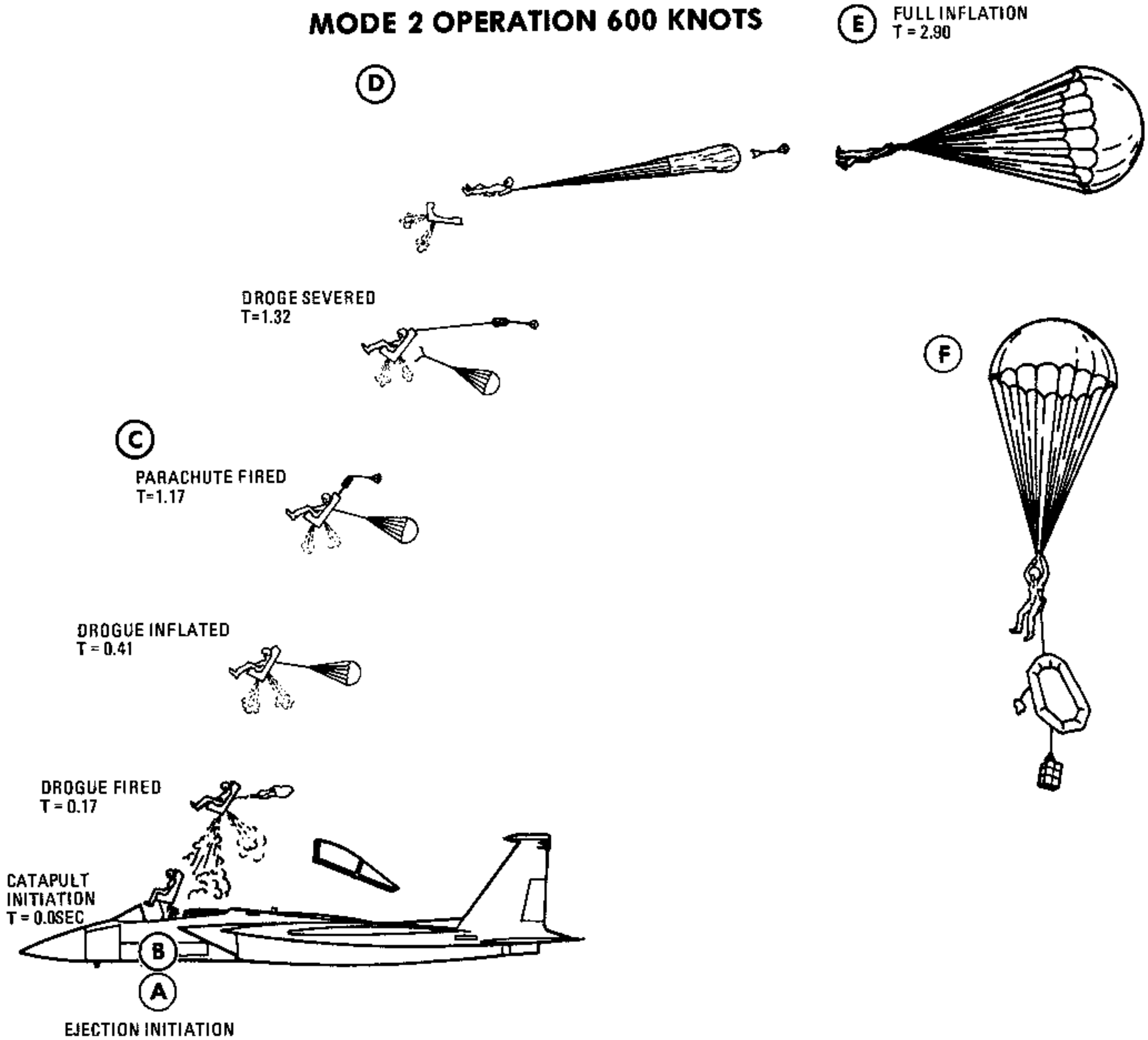
Figure 1-9 (Sheet 1 of 2)

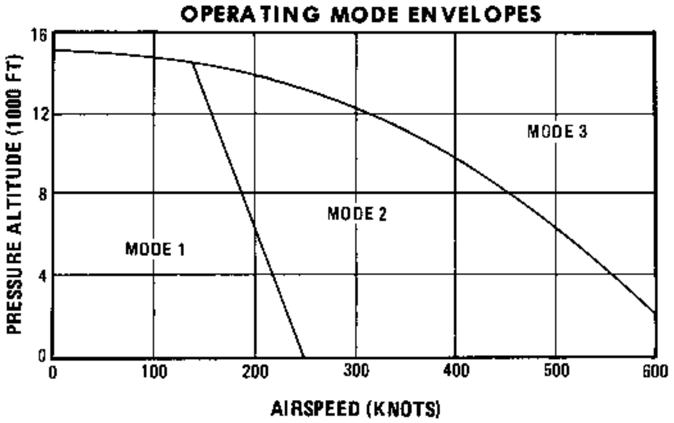
EJECTION SEQUENCES

MODE 2 OPERATION 600 KNOTS



NOTE

- TIMES INDICATED ARE AFTER CATAPULT FIRING. TO DETERMINE TOTAL TIME, A TIME FACTOR FOR THE PERIOD BETWEEN EJECTION HANDLE INITIATION AND CATAPULT FIRING MUST BE ADDED TO THE FIGURES SHOWN. THIS TIME INTERVAL REPRESENTS ESSENTIALLY THE TIME IT TAKES TO REMOVE THE CANOPY AFTER THE EJECTION HANDLE IS PULLED, AND IS APPROXIMATELY 0.3 SECONDS AT ZERO AIRSPEED AND BECOMES SLIGHTLY LESS AS AIRSPEED INCREASES. THERE IS AN ADDITIONAL DELAY OF 0.4 SECONDS BETWEEN REAR AND FRONT SEAT FIRING IN F–15B/D.
- IN MODE 3, WHICH IS DESIGNED FOR HIGH ALTITUDE CONDITIONS, THE DROGUE IS DEPLOYED AS IN MODE 2, BUT MAN–SEAT SEPARATION AND DEPLOYMENT OF THE PARACHUTE ARE DELAYED UNTIL THE PROPER ALTITUDE IS ENCOUNTERED.



15A–1–(134–2)B

Figure 1-9 (Sheet 2)

Seat Adjust Switch

The seat adjust switch is on the left side of the cockpit above the console. The switch has the three positions of UP and DN and is spring-loaded to the center off position. Maximum vertical seat travel is 5 inches. The seat adjustment actuator does not cut off power to the electric motor at either limit of travel. Release the seat adjust switch when the seat reaches an upper or lower limit to prevent damage to the actuator motor.

Ejection Control Handles

There are two ejection control handles, one mounted on each forward upper side of the seat. The controls are interconnected so that actuation of either control initiates ejection. The ejection control pull force is approximately 45 pounds.

Ejection Controls Safety Lever

The ejection controls safety lever is located immediately aft of the left ejection control handle. With the safety lever rotated up and forward both ejection control handles are mechanically locked, and a yellow and black checkerboard placard is displayed to the seat occupant reading EJECTION CONTROLS LOCKED. With the safety lever rotated aft and down, the ejection control handles are unlocked and a black and white placard is displayed reading EJECTION CONTROLS ARMED.

Shoulder Harness Inertia Reel

Pilot shoulder harness restraint is provided by a dual strap shoulder harness inertia reel mounted in the seat below the headrest pads. Automatic locking of the inertia reel occurs when the reel senses excessive rate of strap payout. Manual locking and unlocking of the reel is controlled by the shoulder harness lock/unlock handle.

Shoulder Harness Lock/Unlock Handle

The inertia reel control handle on the left arm rest of the seat is springtensioned and has two positions.

LOCKED	The inertia reel prevents the reel straps from being extended, and ratchets any slack in the straps back into the reel. This prevents the pilot from leaning forward without first unlocking the reel.
UNLOCKED	The reel allows the pilot to lean forward. The inertia portion of the reel will automatically lock the reel when it senses excessive rate of strap pay out. Once the reel has locked automatically, the locked condition must be released by cycling the control lever to locked and back to unlocked.

Restraint Release System

The pilot is held in the ejection seat by a lap belt and the shoulder harness straps. In addition, two survival kit retaining straps connect the pilot's torso harness to the survival kit stored under the rigid seat pan. These straps are not intended for pilot restraint. During ejection, the lap belt, inertia reel straps and seat pan release are automatically released by the recovery sequencer prior to seat-man separation.

Restraint Emergency Release Handle

The restraint emergency release handle, on the right armrest aft of the ejection control handle, can be used as a backup system to the seat automatic seat-man separation function. Pulling the restraint emergency release handle causes release of the lap belt, the inertia reel straps, the seat pan, and the recovery parachute pilot chute from its compartment. Thus, should automatic man-seat separation not occur after ejection, pulling the handle releases all harness restraints except the parachute risers and the survival kit, and also deploys the recovery parachute. The handle is actuated by depressing the trigger on the inside of the handle grip, and then pulling vertically until the handle goes full travel. On aircraft F-15C 79-0067 and F-15D 80-0054 and up, with the ejection seat in the aircraft, pulling the restraint emergency release handle releases all harness restraints (including the survival kit) except for the parachute risers.

WARNING

> If this handle is pulled, safe ejection is impossible.

Battery Window

A battery window, a small circular hole on the right side of the seat forward of the seat rail, gives indication of the status of the seat sequencing system battery. If the battery is activated, a red plunger will puncture the white window.

Survival Kit

The survival kit consists of a fabric case which houses a liferaft, rucksack, and an auxiliary container. The liferaft and rucksack are attached to the survival kit case by a dropline. The auxiliary container, which is for storage of items to be retained with the crewman, is secured inside the survival kit. An AN/URT-33C radio beacon is installed in the kit. The survival kit stows in the seat bucket beneath the rigid seat pan. The pan pivots for withdrawal of the kit during seat-man separation. The kit is attached to the crewmember's harness by attachment fittings on the kit retaining straps. A survival kit auto/manual deployment selector, located on the inside of the forward right thigh support of the kit, permits the pilot to select either manual or automatic deployment of the kit. On aircraft F-15C 79-0067 and F-15D 80-0054 and up with the ejection seat in the aircraft, the survival kit connectors are disconnected when the restraint emergency release handle is actuated.

A (Forward)	The kit automatically deploys after man-seat separation.
M (Aft)	To deploy the kit after man-seat separation the survival kit release handle on the right rear of the kit must be pulled.

AN/URT-33C Radio Beacon Selector Switch

Access to the radio beacon auto/manual selector is gained through a cutout in the front of the seat pan. The selector is a rocker switch. When the left arm (as viewed by the seat occupant) is pressed, MAN is selected. When the right arm is pressed, AUTO is selected.

MAN	Radio beacon will not activate at man-seat separation.
AUTO	Radio beacon activates at man-seat separation.

ENVIRONMENTAL CONTROL SYSTEM

The environmental control system (ECS) provides conditioned air and pressurization, for the cockpit and avionics, windshield anti-fog and anti-ice, anti-G, canopy seal, and fuel pressurization. The ECS uses engine bleed air from both engines for normal operation. Cooling for the avionics, with the air source knob OFF or the cockpit temperature switch OFF, automatically switches to ram air. Ram air cooling is automatically supplied to the avionics whenever compressor inlet duct pressure drops. See foldout section for the ECS schematic.

AIR SOURCE KNOB

The air source knob, on the temperature control panel on the right console, selects the engine bleed air source for the ECS system.

BOTH	Supplies bleed air from both engines.
L ENG	Shuts off bleed air from the right engine.
R ENG	Shuts off bleed air from the left engine.
OFF	Shuts off bleed air from both engines.

CAUTION

Selection of OFF on the air source knob or cabin temperature control switch will switch avionics from normal cooling to ram air cooling. Overheat damage to the avionics may occur. Monitor the ECS light.

BLEED AIR CAUTION LIGHTS

The L and/or R BLEED AIR light on the caution light panel comes on when a bleed air leak is detected between the engine and the primary heat exchanger or the air temperature down stream of the primary heat exchanger becomes excessive.

COCKPIT PRESSURIZATION

Control of the pressure schedule by the cockpit pressure regulator is automatic. Refer to figure 1-10 for the cockpit pressure schedule.

COCKPIT PRESSURE SCHEDULE

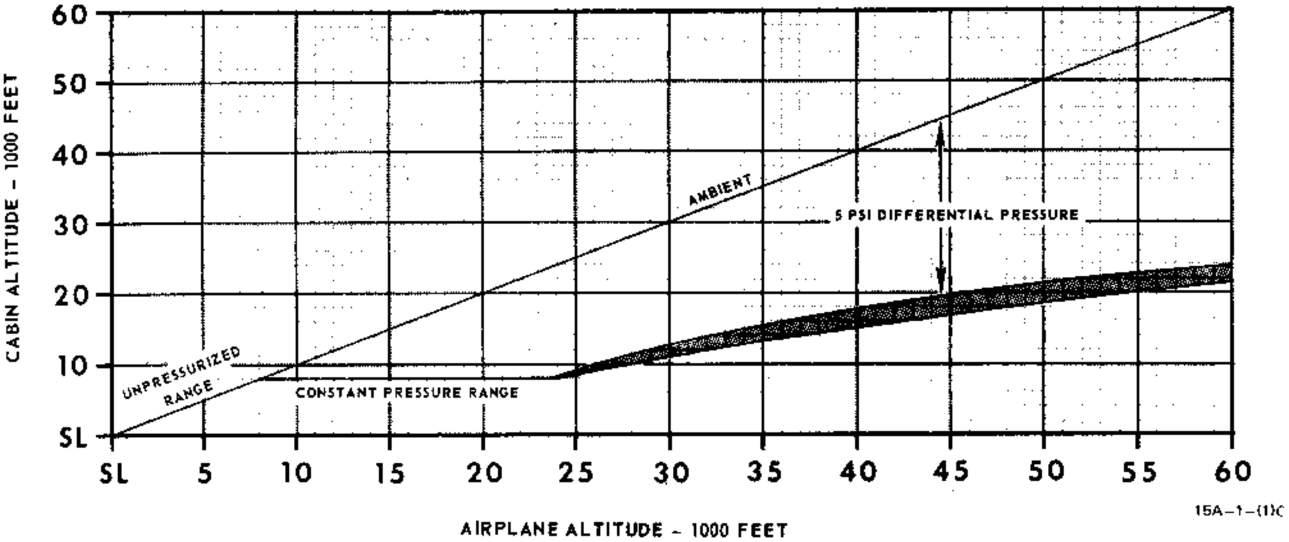


Figure 1-10

COCKPIT PRESSURE ALTIMETER

The pressure altitude of the cockpit is indicated on a 0-50,000 foot pressure altimeter on the right main instrument panel.

COCKPIT TEMPERATURE CONTROL

Cockpit temperature is controlled by the cabin temperature control knob and switch on the temperature control panel.

AUTO	Cockpit temperature is automatically maintained at the temperature selected on the control knob.
MANUAL	Cockpit temperature may be manually changed with the control knob but is not automatically maintained.
OFF	a. Turns off ECS air to the cockpit, avionics, and windshield anti-fog. b. Avionics cooling automatically switches to ram air. c. The canopy seal, fuel pressurization, radar waveguide, anti-G and windshield anti-ice continue to operate if any source is selected.

AVIONICS PRESSURIZATION AND TEMPERATURE

The pressurization and temperature control of the avionics system is automatic.

ECS CAUTION LIGHT

The ECS light on the caution light panel warns of overtemperature or low air flow of the avionics cooling air. With the ECS operating normally, the ECS caution light may come on during low speed flight, particularly at high power settings, or during idle descents. When the ECS caution light comes on during single engine operation on the ground, selected avionics equipment will automatically be turned off. If either engine is shut down after both engines were started, the engine master switch must be placed OFF to reset the automatic avionics shutdown system.

EMERGENCY VENT CONTROL

The emergency vent handle on the right main instrument sub panel, when turned 45° CCW electrically dumps cabin pressure. Extension of the handle shuts off ECS air to the cockpit, diverts all ECS cooling air to the avionics and allows ram air to enter the cockpit.

The amount of cockpit ram air flow is controlled by how far the handle is extended. At full travel the handle is locked. If the handle is pushed in and rotated CW, normal ECS operation is restored.

WINDSHIELD ANTI-FOG

Windshield anti-fog air is supplied when cockpit air conditioning is operating. The anti-fog air temperature may be regulated by the pilot with the anti-fog switch. If the emergency vent handle is turned 45° CCW and pulled, windshield anti-fog hot air is automatically selected.

Anti-Fog Switch

The anti-fog switch allows the pilot to select a range of temperatures for anti-fog air. The switch is electrically held in the HOT or COLD position and automatically resets to NORMAL when electrical power is lost.

NORMAL	Anti-fog air is supplied at normal temperature.
HOT	Anti-fog air is hotter than normal.
COLD	Anti-fog air temperature is controlled by the cockpit temperature control knob and may be varied from colder than normal to hotter than normal.

ANTI-G SYSTEM

The anti-G system is automatic and delivers cooled bleed air to the anti-G suit. The airflow into the suit is proportional to the g force experienced. A manual inflation button in the valve allows the pilot to inflate the suit for checking the system. The system incorporates an automatic pressure relief valve.

ANTI-ICING SYSTEMS

ENGINE ANTI-ICE SWITCH

The engine anti-ice system is comprised of the inlet ice detector and the engine anti-ice valve. The engine anti-ice valve and the inlet ice detector are functionally unrelated. The detector only senses engine inlet ice build up and illuminates the INLET ICE light. The engine heat switch, on the ECS panel, controls the engine anti-ice airflow to the engine nose cone and stationary inlet guide vanes. The F100-PW-220 engine, in addition to the anti-ice air to the engine nose cone and stationary inlet guide vanes, electrically heats the inlet pressure probe. The F100-PW-220 engine DEEC will automatically shut off the engines anti-ice when the altitude is above 30,000 feet or the engine inlet temperature is above 15°C (60°F) regardless of switch position.

ON	Activates the engine anti-ice system.
OFF	Deactivates the engine anti-ice system.
TEST	Checks detector operation, and illuminates the INLET ICE light on the caution panel.

INLET ICE LIGHT

Illumination of the INLET ICE light on the caution light panel indicates an icing condition in the engine inlet duct. The INLET ICE light remains illuminated as long as the icing condition exists and will not be extinguished by activating the engine anti-ice system.

WINDSHIELD ANTI-ICE SWITCH

The windshield anti-ice switch on the ECS panel controls hot airflow from the primary heat exchanger to the windshield exterior anti-ice nozzle.

CAUTION

> Use of the windshield anti-ice system under non-icing conditions may damage the windshield.

ON	Activates the windshield anti-ice system
OFF	Deactivates the windshield anti-ice system.

WINDSHIELD HOT CAUTION LIGHT

The WINDSHLD HOT caution light comes on when windshield anti-ice air temperature is excessive. It does not detect the temperature of the windshield and may not warn of impending windshield damage.

INTERFERENCE BLANKER SYSTEM (IBS)

The interference blanker system prevents or reduces electromagnetic interference between TEWS and other aircraft systems which utilize radio frequency (rf) transmitters and receivers.

UHF COMMUNICATIONS SYSTEM (AIRCRAFT THRU 76-0142 BEFORE TO 1F-15-857)

The UHF communications system provides air-to-air and air-to-ground communications, automatic direction finding (ADF), and monitoring of guard (emergency frequency). The system consists of a main communications transmitter-receiver, communication receiver (aux receiver), guard receiver, electronic control amplifier for ADF, and provisions for a speech security unit (KY-28) for secure communications. The main transmitter-receiver transmits on manually selected frequencies or on 20 preset frequency channels, within the 225.0 to 399.9 MHz frequency range. It also transmits and receives guard (243.0 MHz). The receiver of this unit may be utilized to receive ADF signals within its frequency range and display them on the horizontal situation indicator. The aux receiver is used as a backup receiver for the main transmitter-receiver. It has the same frequency capability as the main transmitter-receiver. The aux receiver may also be used for the ADF functions. The UHF radio can be operated from ground power without cooling air. Minimize transmissions.

MAIN COMMUNICATIONS CONTROL PANEL

The main communications control panel is on the main instrument panel, just below the head-up display (HUD). The controls on the panel include the main UHF volume control knob, main mode selector switch, main manual frequency selector knobs, and the main channel selector knob.

Communication UHF Volume Control Knob

The communication UHF volume control knob adjusts the volume level for the main transmitter-receiver. Turning the knob fully counterclockwise turns off the main transmitter-receiver.

Communication Mode Selector Switch

The communication mode selector switch is a three-position toggle switch which controls the mode of channel selection.

CHAN	Permits the main transmitter-receiver to operate on preset channels 00-19.
MAN	The main transmitter-receiver will operate on the manually selected frequencies.
G	Select the guard frequency (243.0 MHz) for main transmitter-receiver operation.

Communication Manual Frequency Selector Knobs

The three communication manual frequency selector knobs are used to insert UHF frequencies into the main UHF comm set.

Communication Channel Selector Knob

The communication channel selector knob selects any one of 20 preset channels. The selected channel is shown in the main channel select window.

INTEGRATED COMMUNICATIONS CONTROL PANEL

The integrated communications control panel is on the left console. The controls on the panel include the aux mode selector switch, aux channel selector knob, aux manual frequency selector knobs, channel set pushbutton, aux volume control knob, comm antenna selector switch, guard receiver selector switch, ADF selector switch, cipher zero selector switch, cipher comm/aux selector switch, and the ICS volume control knob.

Auxiliary Mode Selector Switch

The auxiliary mode selector switch is a three-position toggle switch which controls the mode of channel selection.

CHAN	Permits the aux receiver to operate on preset channel 00-19.
MAN	Aux receiver will operate on manually selected frequencies.
G	Selects guard frequency (243.0 MHz) for aux receiver operation.

Auxiliary Channel Selector Knob

The auxiliary channel selector knob selects any one of 20 preset channels. The selected channel is shown in the channel select window.

Auxiliary Manual Frequency Selector Knobs

The three auxiliary manual frequency selector knobs are used to manually insert UHF frequencies into the aux receiver.

Channel Set Pushbutton

The channel set pushbutton is used to rechannelize one of the 20 preset channels.

Auxiliary Volume Control Knob

The auxiliary volume control knob adjusts the audio volume for the aux receiver. Turning the knob fully counterclockwise turns off the aux receiver.

Communication Antenna Selector Switch

The communication antenna selector switch is a three position toggle switch.

AUTO	The main transmitter-receiver will automatically select the antenna receiving the strongest signal.
UPPER	Selects the upper UHF antenna.
LOWER	Selects the lower UHF antenna.

Communication Guard Receiver Selector Switch

The communication guard receiver selector switch is a two-position toggle switch.

ON	Enables the guard receiver.
OFF	Disables guard receiver.

ADF Selector Switch

The ADF selector switch is a three-position toggle switch that allows the relative bearing to the UHF transmitting station to be displayed on the number 1 bearing pointer of the HSI.

COMM	Enables ADF operation utilizing the main transmitter/receiver.
AUX	Enables ADF operation utilizing the aux receiver.
OFF	Disables ADF operation.

Cipher Zero Selector Switch

The cipher zero selector switch is a spring-loaded lever-lock switch. When it is momentarily held to zero, the codes stored in the speech security system are set to zero.

Cipher Communication/Aux Selector Switch

The cipher communication/auxiliary selector switch is a three-position lever-lock type switch.

NOTE

> Normal communications are not possible with this switch in any position other than OFF.

COMM	Permits secure voice operations on the main transmitter-receiver.
AUX	Permits secure voice reception on the aux receiver.
OFF	Disables secure voice operations.

ICS Volume Control Knob

The ICS volume control knob adjusts the intercom audio volume level for the pilot's headset.

Microphone Switch

A pushbutton-type microphone switch is on the inboard throttle control handle for UHF transmissions.

UHF COMMUNICATIONS SYSTEM (AIRCRAFT 77-0061 THRU 79-0081 BEFORE TO 1F-15-857)

The UHF communications system provides air-to-air and air-to-ground communications, automatic direction finding (ADF), and monitoring of guard (emergency frequency). The system consists of a control amplifier for ADF and two separate transmitter- receivers (UHF 1 and UHF 2) with their associated controls and indicators. Both radios have provisions for a speech security unit (KY-28) for secure communications. Both transmitter-receivers transmit on manually selected frequencies or on 20 preset frequency channels within the 225.000 to 399.975 MHz frequency range. They also transmit and receive guard (243.00 MHz). The UHF 1 and UHF 2 receivers may be utilized to receive ADF signals within their frequency range and display them on the horizontal situation indicator. The UHF radio can be operated from ground power without cooling air. Minimize transmissions.

NOTE

> In F-15B/D aircraft, if an annoying noise is received by one crewman whose UHF receiver is tuned to a low UHF frequency (230 to 260 MHz) while the second crewman is transmitting at a high UHF frequency on the other radio, the noise can be eliminated by placing the UHF 1 antenna selector switch to UPPER.

UHF CONTROLS AND INDICATORS

The UHF 1 and UHF 2 radios are operated by controls on the integrated communications control panel (primarily for UHF 2), the main communications control panel (UHF 1), and the microphone switch.

INTEGRATED COMMUNICATIONS CONTROL PANEL

The integrated communications control panel (ICCP) is on the left console. The controls on the panel include the mode selector switch, channel selector knob, manual frequency selector knobs, channel set pushbutton, cipher zero-norm switch, cipher radio selector switch, volume control knob, antenna selector switch, guard receiver selector switch, ADF selector switch, and the ICS volume control knob.

UHF 2 Mode Selector Switch

The mode selector switch is a three-position toggle switch which controls the mode of channel selection.

CHAN	Permits the UHF 2 receiver to operate on preset channel 00-19.
MAN	UHF 2 receiver operates on manually selected frequencies.
G	Selects guard frequency (243.00 MHz) for UHF 2 receiver operation.

UHF 2 Channel Selector Knob

The channel selector knob selects any one of 20 preset channels. The selected channel is shown on the channel select window of the control panel.

UHF 2 Manual Frequency Selector Knobs

The manual frequency selector knobs are used to manually insert UHF frequencies into the UHF 2 receiver.

UHF 2 Channel Set Pushbutton

The channel set pushbutton is used to rechannelize one of the 20 preset channels.

Cipher Zero-Norm Switch

The cipher zero-norm switch is a lever-lock switch. When the switch is placed to ZERO the codes stored in the speech security system are set to zero. With the switch in the NORM position, codes can be stored in the speech security system.

Cipher Radio Selector Switch

The cipher radio selector switch is a lever-lock switch with positions of UHF 1, UHF 2, and OFF. Placing the switch to UHF 1 permits secure speech operations on the UHF 1 transmitter-receiver. Placing the switch to UHF 2 permits secure speech operations on the UHF 2 transmitter-receiver. In the OFF position, there are no secure speech operations on either UHF 1 or UHF 2 radios.

UHF 2 Volume Control Knob

The volume control knob adjusts the volume for the UHF 2 receiver and guard receiver. Turning the knob fully counterclockwise turns off the UHF 2 transmitter-receiver.

UHF 1 Antenna Selector Switch

The antenna selector switch is a three-position toggle switch.

AUTO	The UHF 1 transmitter-receiver automatically selects the antenna receiving the strongest signal.
UPPER	Selects the upper UHF antenna.
LOWER	Selects the lower UHF antenna.

Guard Receiver Selector Switch

The guard receiver selector switch is a three-position toggle switch.

UHF 1	Enables the UHF 1 guard receiver.
UHF 2	Enables the UHF 2 guard receiver.
OFF	Disables both guard receivers.

ADF Selector Switch

The ADF selector switch is a three-position toggle switch that allows the relative bearing to the UHF transmitting station to be displayed on the number 1 bearing pointer of the HSI.

UHF 1	Enables ADF operation utilizing the UHF 1 transmitter-receiver.
UHF 2	Enables ADF operation utilizing the UHF 2 transmitter-receiver.
OFF	Disables ADF operation.

ICS Volume Control Knob

The ICS volume control knob adjusts the intercom audio volume level for the pilot's headset.

Microphone Switch

A three-position microphone switch is on the inboard throttle control handle for UHF transmissions. Pushing the switch forward enables transmission on the UHF 1 transmitter. Pushing the switch aft enables transmission on the UHF 2 transmitter. The center position OFF disables all UHF transmission.

MAIN COMMUNICATIONS CONTROL PANEL (UHF 1)

The main communications control panel (UHF 1) is on the main instrument panel, just below the head-up display (HUD) and is used for operating the UHF 1 radio. The controls on the panel include the main UHF volume control knob, main mode selector switch, main manual frequency selector knobs, and the main channel selector knob.

Main UHF Volume Control Knob

The main UHF volume control knob adjusts the volume level for the main transmitter-receiver and guard receiver. Turning the knob fully counterclockwise turns off the main transmitter-receiver.

Main Mode Selector Switch

The main mode selector switch is a three-position toggle switch which controls the mode of channel selection.

CHAN	Permits the main transmitter-receiver to operate on pre-set channels 00-19.
MAN	The main transmitter-receiver will operate on the manually selected frequencies.
G	Selects the guard frequency (243.00 MHz) for UHF 1 transmitter-receiver operation.

Main Manual Frequency Selector Knob

The three main manual frequency selector knobs are used to insert UHF frequencies into the UHF 1 main radio.

Main Channel Selector Knob

The main channel selector knob selects any one of 20 preset channels. The selected channel is shown on the main channel select window.

UHF COMMUNICATIONS SYSTEM (AIRCRAFT 80-0002 AND UP AND ALL OTHERS AFTER TO 1F-15-857)

The UHF communications system provides air-to-air and air-to-ground communications, automatic direction finding (ADF) and monitoring of guard (emergency frequency). The system consists of a control amplifier for ADF and two separate transmitter-receivers (R1 and R2) with their associated controls and indicators. Both transmitter-receivers transmit on manually selected frequencies or on 20 preset frequency channels within the 225.000 to 399.975 MHz frequency range. The R1 transmitter-receiver may be utilized to receive ADF signals within its frequency range and display them on the horizontal situation indicator. Aircraft that contain a modified UHF radio (RT-1145A or 1145C/ARC-164) can operate in HAVE QUICK modes (anti-jam). The UHF radios can be operated from ground power without cooling air; however, transmissions should be minimized.

NOTE

> In F-15B/D aircraft, if an annoying noise is received by one crewman whose UHF receiver is tuned to a low UHF frequency (230 to 260 MHz) while the second crewman is transmitting at a high UHF frequency on the other radio, the noise can be eliminated by placing the R1 antenna selector switch to UPPER.

UHF CONTROLS AND INDICATORS

The R1 and R2 radios are operated by controls on the integrated communications control panel (primarily for R2), the main communications control panel (R1), and the microphone switch.

INTEGRATED COMMUNICATIONS CONTROL PANEL

The integrated communications control panel (ICCP) is on the left console. The controls and indicators on the panel include the R2 mode selector knob, R2 channel selector knob, R2 channel indicator, frequency/JTIDS selector knobs, frequency/JTIDS indicators, intensity control knob, transmit selector switch, channel set switch, frequency display switch, intercom volume control knob, R2 volume control knob, R1 antenna selector switch, R2 antenna selector switch, RADIO 1 guard receiver/tone switch, and the R1 ADF switch.

R2 Mode Selector Knob

The R2 mode selector knob has four positions which control the mode of channel selection. The VHF/FM position is not used.

CHAN	Enables R2 preset channel frequency selection.
MAN	Enables R2 manual frequency selection.
OFF	Turns off R2 radio.
G-AM	Inoperative
G-VHF FM	This position is redundant with a UHF radio installed in the R2 position. However, in this event, the UHF AM guard frequency will still be selected in this position.

R2 Channel Selector Knob

The channel selector knob selects any one of 20 preset channels for R2 (channels 00 thru 19).

R2 Channel Indicator

The channel selected by the channel selector knob is displayed on the channel indicator above the knob.

Frequency/JTIDS Selector Knobs

The frequency/JTIDS selector knobs manually select desired R2 UHF frequencies.

Frequency/JTIDS Indicators

The frequency/JTIDS indicators display the R1 or R2 frequency selected when the frequency display switch is set to either R1 or R2 position.

Intensity Control Knob

This knob, labeled INT, with positions of MIN (minimum) and BRT (bright), adjusts the light intensity in the frequency/JTIDS and channel indicators. Turning the knob to MIN decreases the light intensity and turning it to BRT increases the intensity. Pushing the knob in causes the number either to appear in all windows of the indicators.

Transmit Selector Switch

This switch has positions of R1-R2 and NORM. Placing the switch to R1-R2 enables both R1 and R2 radios to transmit simultaneously when the microphone switch is pushed either forward or aft. With the switch to NORM, the microphone switch is used to transmit on one radio at a time. To enable the R1-R2 transmit function the KY-58 control panel C/RAD 1-PLAIN-C/RAD 2 select knob must be set to PLAIN. A cover is installed below the transmit switch to prevent selection of JTIDS mode at the present time.

Channel Set Switch

The channel set switch, labeled CHAN SET, is a three-position toggle switch, spring-loaded to center, with positions of R1 and R2. Setting the switch to R1 enables a desired manual frequency selection to be inserted into memory storage for R1. Setting the switch to R2 enables a desired manual frequency selection to be inserted into memory storage for R2.

Frequency Display Switch

This is a three-position toggle switch, spring-loaded to center, labeled DIS FREQ, with positions of R1 and R2. Placing the switch to R1 enables the R1 commanded frequency to be displayed momentarily on the frequency/JTIDS indicators. Placing the switch to R2 enables the R2 commanded frequency to be momentarily displayed on the frequency/JTIDS indicators.

NOTE

> A lock-up condition could occur on the R1 or R2 radio thereby losing communication capability on the affected radio. This condition can be corrected by selecting the radio position (on the frequency display switch) of the radio which is locked up (R1 locked up, select R1, R2 radio locked up, select R2). The selected radio controller re-initializes in about 1/2 seconds at which time that radios frequency is displayed on the frequency/JTIDS indicators. After this occurs the locked up radio can be reselected and is restored when its frequency is displayed on the indicators.

Intercom Volume Control Knob

The intercom volume control knob, labeled ICS, adjusts the intercom audio volume level in the headset.

R2 Volume Control Knob

The R2 volume control knob is labeled R2 and adjusts the R2 audio volume in the headset.

R1 Antenna Selector Switch

The R1 antenna selector switch is a three-position toggle switch which is labeled R1 ANT and has positions of UPPER, AUTO, and LOWER.

UPPER	Selects the upper UHF antenna for R1.
AUTO	The R1 transmitter-receiver automatically selects the antenna receiving the strongest signal.
LOWER	Selects the lower UHF antenna for R1.

R2 Antenna Selector Switch

The R2 antenna selector switch is not operative. The R2 radio is connected directly to the TACAN/UHF antenna.

RADIO 1 Guard Receiver/Tone Switch

This three-position toggle switch, labeled RADIO 1, has positions of G REC, OFF, and TONE.

G REC	Turns on the R1 guard receiver.
OFF	Turns off the R1 guard receiver.
TONE	Enables a 1020 Hz tone in R1 and keys the R1 transmitter.

R1 ADF/R1-R2 C-TEXT Switch

This switch has positions of ADF, OFF, and momentary position of R1-R2 C-TEXT.

ADF	Turns on the ADF system and selects R1 for ADF reception.
OFF	Turns off ADF system.
R1-R2 C -TEXT	Momentarily inhibits all incoming radio plain text audio messages.

MAIN COMMUNICATION CONTROL PANEL

The main communications control panel (MCCP) is on the main instrument panel, just below head-up display (HUD) and contains the primary controls for operating the R1 radio. The controls and indicators on the panel include the R1 volume control knob, R1 mode selector knob, manual frequency indicators, manual frequency selector knobs, R1 channel selector knob, and the R1 channel indicator.

R1 Volume Control Knob

The R1 volumne control knob is labeled VOL and has a position labeled OFF. Turning the knob clockwise turns on R1 and adjusts the R1 audio volume in the headset.

R1 Mode Selector Knob

The R1 mode selector knob has positions labeled CHAN, MAN, GUARD, AC, AM, and T. The switch positions of AC, AM, and T are used in the HAVE QUICK modes of operation and are discussed more fully in the HAVE QUICK MODES description, this section.

CHAN	Enables R1 preset channel frequency selection.
MAN	Enables R1 manual frequency selection.
GUARD	Tunes R1 to the guard frequency.
AC	Enables active channel function for A/J mode.
AM	Enables active manual function for A/J mode.
T	Enables radio to accept a time-of-day signal.

Manual Frequency Indicators

The manual frequency indicators display the manual frequency selected for the R1 radio.

Manual Frequency Selector Knobs

The manual frequency selector knobs are used to manually select the R1 radio frequencies.

R1 Channel Selector Knob

The channel selector knob selects any one of 20 preset channels for R1.

R1 Channel Indicator

The channel selected by the channel selector knob is displayed on the channel indicator above the knob.

MICROPHONE SWITCH

A three-position microphone switch is on the inboard throttle control handle for UHF transmission. Pushing the switch forward enables transmission on the R1 transmitter. Pushing the switch aft enables transmission on the R2 transmitter. The center position OFF disables all UHF transmission.

INTERCOM SYSTEM

Intercommunications between the pilot and ground crew is provided by the intercom system. An external receptacle and volume control are installed on the aircraft exterior for the ground crew. The exterior volume control knob controls intercom volume to the ground crew headset. The cockpit ICS volume control knob controls the intercom volume to the pilot's headset. The intercom operates with JFS power, external power, or normal or emergency generator power.

SECURE SPEECH SYSTEM (KY-28)

The KY-28 speech security unit is interfaced with the UHF communications system to enable secure voice communications. The KY-28 possesses both enciphering (crypto coding) and deciphering (crypto decoding) capabilities which enable both transmission and reception of secure speech information. Secure speech communication is possible with other KY-28 equipped aircraft, KY-8 equipped surface installations, and KY-28 manpack units. Conventional (uncoded) UHF communication may be selected at any time.

KY-28 CONTROLS (AIRCRAFT THRU 79-0081 BEFORE TO 1F-15-857)

The KY-28 controls consist of the cipher zero-norm switch and the cipher radio selector switch on the ICCP.

Cipher Zero - Norm Switch

The cipher zero-norm switch is a lever-lock switch. When the switch is placed to ZERO the codes stored in the speech security system are set to zero. With the switch in the NORM position, codes can be stored in the speech security system.

Cipher Radio Selector Switch

The cipher radio selector switch is a lever-lock switch with positions of UHF 1/COMM, UHF 2/AUX, and OFF. Placing the switch to UHF 1/COMM permits secure speech operations on the UHF 1/COMM transmitter-receiver. Placing the switch to UHF 2/AUX permits secure speech operations on the UHF 2/AUX transmitter-receiver. In the OFF position, there are no secure speech operations on either UHF 1/COMM or UHF 2/AUX radios. Shortly after the microphone button is pressed for transmission, a short beep tone is heard in the headset. The tone indicates the speech security unit is ready to encipher the transmission. The normal transmission side tone is retained in the headset during cipher transmission. The KY-28 unit switches to a standby condition when the microphone button is released. The guard receiver operates normally regardless of KY-28 operation.

KY-28 CONTROL PANEL (80-0002 AND UP AND ALL OTHERS AFTER TO 1F-15-857)

The KY-28 control panel contains a zeroize switch, a delay switch, a C/RAD 1-PLAIN-C/RAD 2 select knob, and a power select switch.

Zeroize Switch

The zeroize switch zeroizes the code set in the KY-28. Seat ejection by the pilot also zeroizes the code.

Delay Switch

The delay switch is a two position toggle switch with the forward position being the ON position. Pushing the switch forward (ON) increases the interval between the time the transmitter is keyed and the beep tone is heard that indicates the system is ready to transmit.

C/RAD 1-PLAIN-C/RAD 2 Select Knob

This three-position knob has positions of C/RAD 1, PLAIN, and C/RAD 2.

C/RAD 1	Selects secure speech operation of R1 modulation and received audio signals by switching these signals through the KY-28 for encoding and decoding.
PLAIN	Enables transmission and reception of plain audio text by R1 and R2 with the KY-28 system installed.
C/RAD 2	Selects secure speech operation of R2 modulation and received audio signals by switching these signals through the KY-28 for encoding and decoding.

Power Switch

Placing the power switch to the forward position (ON) applies operating power to the KY-28 secure speech system.

SECURE SPEECH SYSTEM (KY-58) (AIRCRAFT 80-0002 AND UP AND ALL OTHERS AFTER TO 1F-15-857)

The secure speech system (KY-58) is used for ciphering (coding) or deciphering (decoding) audio routed through the R1 and R2 transmitter-receivers. The system consists primarily of the KY-58 control panel on the left console. The controls for the system are on the control panel. The system also contains a KY-58 processor/adapter.

KY-58 CONTROL PANEL

The KY-58 control panel contains a zeroize switch, a delay switch, a C/RAD 1-PLAIN-C/RAD 2 select knob, a mode select knob, a power switch, and a fill select knob.

Zeroize Switch

The zeroize switch zeroizes memory locations (1 thru 6) in the KY-58 unit adapter. Seat ejection by the pilot also zeroizes the 6 memory locations.

Delay Switch

The delay switch is a two-position toggle switch with the forward position being the ON position. Pushing the switch forward (ON) increases the interval between the time the transmitter is keyed and the beep tone is heard that indicates the system is ready to transmit.

C/RAD 1-PLAIN-C/RAD 2 Select Knob

This three-position knob has positions of C/RAD 1, PLAIN, and C/RAD 2.

C/RAD 1	Selects secure speech operation of R1 modulation and received audio signals by switching these signals through the KY-58 processor/adapter for encoding and decoding.
PLAIN	Enables transmission and reception of plain audio text by R1 and R2 with the KY-58 system installed.
C/RAD 2	Selects secure speech operation of R2 modulation and received audio signals by switching these signals through the KY-58 processor/adapter for encoding and decoding.

Mode Select Knob

The mode select knob has positions of OP (operation), LD (load), and RV (receive variable).

OP	Places the KY-58 into operational mode.
LD	Allows variables to be loaded into memory locations in the KY-58 processor/adapter.
RV	Places the KY-58 into receive variable mode.

Power Switch

Placing the power switch to the forward position (ON) applies operating power to the KY-58 secure speech system.

Fill Select Knob

This knob has positions of 1 through 6 which selects the variable memory locations.

KY-58 PROCESSOR/ADAPTER

The KY-58 processor/adapter contains controls which are set before flight and are not accessible to the pilot. The OFF, ON, TD knob must be set to the ON or TD position or the KY-58 system will be inoperative.

HAVE QUICK SYSTEM (AFTER TO 1F-15-704)

The HAVE QUICK system provides anti-jam (AJ) capability to the UHF communication network. This is accomplished in training modes and other anti-jam modes by using a technique called frequency hopping whereby the channel or frequency being used for communication on a given link is rapidly changed many times per second. It is difficult to jam the link since it is not obvious which channel is being used, and also there is no pattern evident in the manner in which the channels are being changed. The HAVE QUICK radio has stored within it a pattern of the frequencies to be used for a given day, and the pattern is then utilized according to the time of day. For every time slot in that day, where each time slot is a small part of a second, there is a specific channel which must be used for a given net, whether it is receiving or transmitting. Because the particular frequency used at a particular instant depends on the precise time of day, both terminals of a have quick communication link must have clocks which must be synchronized. The usual operating mode for a HAVE QUICK radio is its normal mode where it uses any one of 7000 channels available to the UHF communications. The radio must be suitably primed to permit this switchover.

RADIO PRIMING

Priming consists of setting three control entries into the radio. These control entries are word-of-day (WOD), time-of-day (TOD), and anti-jam net number.

WORD-OF-DAY (WOD)

The WOD is normally entered prior to flight, but it is possible to enter it in flight. For training mode, a WOD is entered into preset channel 20 only and should be one of the following frequencies: 300.000, 300.025, 300.050, or 300.075 MHz. For other AJ modes, WOD is entered into the HAVE QUICK control panel beginning with preset channel 20 and proceeding in reverse order to channels 19, 18, etc. until all assigned numbers are inserted. The procedure for entering a WOD frequency is the same as for normal mode preset channel insertion.

TIME-OF-DAY (TOD)

The TOD entry can be performed before flight or in flight after the radio is turned on. The correct time-of-day is set into the HAVE QUICK radio by entering into the radio receiver a signal carrying the proper time modulation. The signal can be provided by another HAVE QUICK radio which has the correct time, or it can be provided by a ground-based clock. In an emergency, when TOD is not available from an external source, selecting the T position on the T-2-3-A selector knob and simultaneously pressing the tone pushbutton initiates the radio's clock. The radio cannot properly operate with other nets when initiated in this manner. The radio acts as a TOD source for its own independent net, and any radio which has received time from this radio is able to operate on the resulting net.

Time-of-Day Transmission

It is possible to transmit TOD in both normal and AJ modes by momentarily pressing the tone pushbutton. In normal mode a complete TOD message is transmitted, while in the AJ mode only an updating time-tick is used. An AJ mode time transmission allows a time update to be made if a radio is drifting out of synchronization.

Time-of-Day Reception

Reception is possible in both normal and AJ modes. The radio automatically accepts only the first TOD message received after the radio is turned on. Subsequent messages are ignored unless the T position is selected. The radio accepts the next TOD received in either normal or AJ mode provided it arrives within 1 minute of the time the T position is selected. To receive time in normal mode, rotate the knob to T position and return to the normal channel in either manual or preset mode and wait for the TOD message. To receive a time update in AJ mode, rotate the knob to T position and then back to the A position. A TOD update (time-tick) can now be received on any AJ net.

ANTI-JAM NET NUMBER

In the training mode there are five anti-jam numbers 0 to 4, which are selected by the hundreds of kilohertz frequency selector. To insert a frequency into a preset channel for AJ training mode operation, first set the mode selector knob to PRE (preset). Then set the manual frequency selector knobs to the frequency to be placed in memory, and place the preset channel selector knob to the desired channel number. Press the set pushbutton and the frequency is set into the selected channel. If a preset channel is being used, the net is determined by the information stored in the hundreds of kilohertz location of the preset channel selected. In other AJ modes the net number is assigned and can be dialed in using the manual frequency selector or selecting the designated preset channel.

HAVE QUICK CONTROL PANEL

The HAVE QUICK control panel, on the left console of the front cockpit, contains the controls and indicators for the HAVE QUICK system. These controls are described in the following paragraphs.

Manual Frequency Selector Knobs

These knobs manually set a desired frequency into the UHF 2 receiver-transmitter.

T-2-3-A Selector Knob

This knob has positions of T, 2, 3, and A. With the knob in the A position, the HAVE QUICK radio is in the AJ mode. In the training mode of AJ operation five nets can be used. In manual frequency select mode, the net is determined by the hundreds of kilohertz selector knob. In preset channel mode, the net is determined by the information stored in the hundreds of kilohertz location of the preset channel selected. The five valid nets are designated 0 to 4. If AJ operation is selected using a 5 thru 9 in either manual or preset mode for the hundreds of kilohertz position, the nets will be repeated (i.e., 5 selects net 0, 6 selects net 1 . . . . . 9 selects net 4). In other AJ modes the net number is assigned and can be dialed in using the manual frequency selectors or selecting the designated preset channel. Placing the knob to the 3 or 2 position places the radio in the normal operating range of 225.00 to 399.97 MHz. Placing the knob to the momentary T (time-of-day) position enables the UHF 2 radio to accept a new time-of-day for up to 1 minute after being selected.

Tone Pushbutton

Before TOD reception, pressing the tone pushbutton transmits a normal tone. After the radio has received TOD, pressing the pushbutton transmits TOD. Continued pressing of the pushbutton after the TOD message is tansmitted causes the normal tone to be heard.

Dim Control Knob

Turning this knob varies intensity of the control panel lighting.

Mode Selector Knob

The rotary mode selector knob has positions of GD (guard), PRE (preset), and the MAN (manual). The GD position is not used on the HAVE QUICK control panel. The guard mode for UHF 2 is disabled. Placing the mode selector knob to PRE permits insertion of selected frequencies into preset channels in the normal mode, and insertion of word-of-day and AJ net number in the AJ mode.

Preset Channel Selector Knob

This knob selects one of 14 preset channels (1 thru 14) in the normal mode. In the AJ mode, six preset channels (20 thru 15) are used. Preset channel 20 is used for word-of-day storing and preset channels 19 thru 15 have the actual frequencies entered which are used during the AJ training mode of operation. In AJ modes other than training mode, the assigned numbers or frequencies are inserted beginning with preset channel 20 and proceeding backward to 19, 18, etc. until all assigned numbers are inserted. All channels not used for AJ mode may be used for normal communications. Channel 20 is reserved for AJ mode and cannot be used in normal mode.

CHAN (Channel) Indicator

The channel indicator displays the preset channel number (1 thru 20) selected with the preset channel selector knob.

Set Pushbutton

The set pushbutton, when pressed, stores the selected frequency in memory for the selected preset channel.

Memory Frequency Indicator

After power is applied to the HAVE QUICK system and the read pushbutton is pressed, the memory frequency indicator displays either the frequency set in manual mode or the preset frequency set in the channel indicator. The display on the memory frequency indicator appears in normal mode and in AJ mode.

Read Pushbutton

Pressing this pushbutton enables the display on the memory frequency indicator.

NORMAL OPERATION

The HAVE QUICK system receives power when the UHF 2 volume control knob on the integrated communications control panel is rotated clockwise from the OFF position. The UHF 2 radio is in the normal operation mode when the T-2-3-A selector knob is set to the 2 or 3 position. In this mode the radio can use any of the 7000 channels available to the UHF communication band. Secure speech can be used in the normal mode if desired. If jamming is encountered, the radio is placed in the AJ mode by rotating the T-2-3-A selector knob to the A position. If the radio has been properly primed by setting in the word-of-day and the time-of-day, it is ready for anti-jam use by manually selecting the desired frequency or by setting in the desired preset channel on the channel indicator. Secure speech operation is not available in the AJ mode.

Anti-Jam Operation

An operator whose radio has TOD should be contacted on any normal channel. A TOD which sounds like a tone when received should be requested. With the mode selector knob set to PRE (preset), the preset channel selector knob should be cycled through preset channels starting with channel 20 and proceeding in reverse order to channels 19, 18, 17, etc. waiting for a short tone at each channel. The radio will indicate that the entries are complete when two short tones are heard. Coordinating with the operator, AJ mode is initiated by placing the T-2-3-A selector knob to the A position. If a warning tone is heard when A is selected, either TOD has not successfully been received or presets 20-15 have not been properly read. If a warning tone is heard, attempt to transmit TOD by momentarily pressing the tone pushbutton. The result should be a short term burst after the button is released. If a tone is heard which lasts for only the momentary time the button is pressed, the radio does not have TOD and it should be requested from the other operator. If the radio has TOD and sounds a warning tone when anti-jam is attempted on a proper net, then it has not properly read the assigned preset channels. Cycle preset channels beginning with 20 and proceeding in reverse order until two short tone bursts are heard. If the radio does not have a warning tone but AJ communication still cannot be made to other units, verify that all units have the same WOD entered in the assigned presets, and that the units all have the same net dialed upon the hundreds of kilohertz manual frequency selector knob. If for some reason the radio ceases to function, the anti-jam system can be reset by turning off the radio for five seconds and then back on. It is then necessary to receive TOD again and to cycle thru preset channels 20 thru 15 as before.

HAVE QUICK MODES (R1 ONLY) (AFTER TO 1F-15-806 OR TO 1F-15-857)

HAVE QUICK anti-jam (A/J) modes are operational only in aircraft which have a modified UHF comm transmitter-receiver (RT-1145A or 1145C/ARC-164) installed. The normal R1 guard, manual, and channel modes are not changed by the installation of the modified radio. When in the active channel (AC) or active manual (AM) modes, the modified radio uses a frequency hopping method to change the channel or frequency selected many times a second. To operate in the anti-jam modes, all radios in a particular net must have the same word-of-day (WOD), time-of-day (TOD), net number, and the same frequencies stored in allocated preset channel locations. Description of the HAVE QUICK system is based on training net operation. For training nets, channel 00 is used to store WOD and channels 19 thru 15 are used to store the preset frequencies.

MODIFIED UHF RADIO (R1)

The modified UHF radio (RT-1145A or 1145C/ARC-164) contains a clock, memory circuits, and a real time code generator. This added circuitry allows the radio to change frequencies many times a second. The WOD and anti-jam frequencies are sent from the ICCP to the memory. The WOD sets up the pattern for hopping the frequencies stored in the memory. A TOD signal from the anti-jam net control station synchronizes the radio clock to the other radios in the net. The clock times the operation of the real time code generator. When AC or AM anti-jam modes are selected, signals are sent which activate the real time code generator and the anti-jam mode is placed in operation.

WORD-OF-THE-DAY (WOD)

The WOD is normally entered prior to flight, but it is possible to enter it in flight. The WOD defines the frequency hopping pattern for the day for the radio. If the radio is switched to OFF, the R1 mode selector knob on the MCCP must be set to CHAN, and the R channel selector knob set to 00 to transfer the WOD from the ICCP data memory to the radio. The same must be done for the 5 preset channel frequencies. At each setting of the R1 channel selector knob from 00 down thru 16 a single beep is heard in the headset. A brief pause until the beep is heard at each channel setting is required to ensure proper transfer of data to the radio. After channel 15 a double beep tone is heard which indicates that the radio has accepted the WOD and the 5 preset frequencies. The HAVE QUICK WOD and 5 preset frequencies need only be set up and stored in one cockpit ICCP.

TIME-OF-DAY (TOD)

The TOD entry is normally performed before flight, but can be done in flight after the radio is turned on. TOD synchronizes the HAVE QUICK radio to the net control station and the other radios in the net. After the radio is turned on it accepts the first TOD signal it receives on any channel or frequency in use. To ensure that the radio is operating in the correct net, request a TOD from the net control station, or request a TOD from another station in the net which has previously received TOD from the net control station. TOD is entered by momentarily setting the R1 mode selector knob on the MCCP to T then back to MAN or CHAN as appropriate, and requesting a TOD from the net control station. The TOD is heard in the headset as a short burst of varying tones followed by a steady tone. The steady tone lasts as long as the station keeps the sending transmitter in the tone setting. If the TOD is not received within one minute, repeat the above procedure. Do not leave the R1 mode selector knob set to T or the radio could receive false TOD signals from other sources. After TOD is received it can be transmitted to other stations in the net by placing the ICCP R1 guard receiver/tone switch to the TONE position. If anti-jam communication is attempted with an invalid TOD the received signal is not readable and it is necessary to request another TOD transmission.

NET NUMBER

There are five valid anti-jam training net numbers, 0 to 4, which are selected by the tenths megahertz (first decimal position) setting of MCCP manual frequency selector knobs in the AM mode, or the MCCP channel selector in the AC mode. If anti-jam operation is selected using a 5 or 9 in the tenths megahertz (first decimal position) position of the frequency in use, a low level warning tone will be heard indicating a wrong selection. The warning tone is disabled by selecting another frequency with 0 to 4 in the hundreds of kilohertz position, or by taking the radio out of anti-jam mode.

ACTIVE CHANNEL MODE

The active channel (AC) mode is selected by setting the MCCP R1 mode selector knob to AC, and the MCCP R1 channel selector knob to any channel that has a proper net (frequency) stored in the R1 channel memory, except 00, which is reserved for WOD. The anti-jam frequency hopping activity then goes into operation.

ACTIVE MANUAL MODE

The active manual (AM) mode is selected by setting the MCCP R1 mode selector knob to AM, and the MCCP manual frequency selector knobs to the desired frequency. The anti-jam frequency hopping activity then goes into operation.

LIGHTING EQUIPMENT

EXTERIOR LIGHTING

Exterior lights are controlled from either the exterior lights control panel or the miscellaneous control panel, both on the left console.

Position Lights

The position lights include a green light on the forward edge of the right wing tip, a red light on the forward edge of the left wing tip, and a white light just below the tip of the left vertical tail fin. The position lights are controlled by a knob on the exterior lights control panel labeled POSITION. With the anti-collision lights on, the position lights automatically go to steady full brilliance, regardless of the position of the position lights knob.

OFF	Lights are off.
1 - 5	Guide numbers for varying brightness from off to full bright.
BRT	Lights are at full brightness.
FLASH	The lights will flash at full brightness.

Anti-Collision Lights

There are three red anti-collision lights; one on the leading edge of each wing just outboard of the air intake and another just below the tip of the right vertical tail fin. The anti-collision lights are controlled by a single toggle switch on the exterior lights control panel labeled ANTI-COLLISION. The switch positions are OFF and ON.

Formation Lights

Six green electroluminescent formation lights are provided. Two lights are on the wingtips behind the position lights, two lights are on the side of the forward fuselage just forward of the cockpit, and two lights are on the aft fuselage just aft of wing trailing edge. The formation lights are controlled by a single knob on the exterior lights control panel labeled FORMATION.

OFF	Lights are off.
1-5	Guide numbers for varying brightness from off to full bright.
BRT	The lights are at full brightness.

Landing and Taxi Lights

The landing and taxi lights are on the nose gear strut. They are controlled by a toggle switch on the miscellaneous control panel. The lights are off, regardless of switch position, on aircraft through 73-107 when the nose wheel is not down and locked, or on aircraft 74-081 and up, when the landing gear handle is in the up position.

OFF	Lights are off.
LDG LIGHT	If the nose gear is down and locked through 73-107 or the landing gear handle is down 74-081 and up, the landing light is turned on.
TAXI	If the nose gear is down and locked through 73-107 or the landing gear handle is down 74-081 and up, the taxi light is turned on.

INTERIOR LIGHTING

Except for the utility floodlight, armament control panel, and navigation control indicator, all the controls for interior lights are on the interior lights control panel on the right console.

Flight Instrument Lighting

Integral lighting is provided for the following flight instruments: ADI, HSI, airspeed mach indicator, altimeter, vertical speed indicator, angle-of-attack indicator, clock, and accelerometer. The lights are controlled by the flight instrument lights knob, labeled FLT INST, which provides variable lighting between position OFF and BRT.

Engine Instrument Lighting

Integral lighting is provided for the following engine instruments: L & R tachometers, L & R FTIT, L & R fuel flow indicators, PC1, PC2 and utility hydraulic pressure indicators, oil/hydraulic lightplate, L & R nozzle position indicators, L & R oil pressure indicators, and the fuel quantity indicator. The lights are controlled by the engine instrument lights knob, labeled ENG INST, which provides variable lighting between positions OFF and BRT.

Auxiliary Instruments Lighting

The lights and lightplates on the instrument panel that are not controlled by the flight instruments or engine instruments lights knobs are controlled by the auxiliary instruments lights knob labeled AUX INST, which provides variable lighting between positions OFF and BRT.

Console Lighting

The console lights are controlled by the L CONSOLE and R CONSOLE knobs which provide variable lighting between positions OFF and BRT.

ACS Control Panel Lighting

The ACS control panel lights are controlled by the LT knob on the panel, which provides variable lighting between positions OFF and BRT.

Storm/Flood Lighting

Four storm/flood lights are provided as secondary cockpit lighting. The four lights are under the canopy sills, two above each console. The lights are controlled by the storm/flood lights knob labeled STORM FLOOD, which provides variable lighting between OFF and BRT. If the warning/caution/BIT/advisory lights are in the dimmed condition, moving the storm/flood lights knob to full BRT causes the warning/caution/BIT/advisory lights to revert to full intensity, regardless of the position of the WARNING CAUTION control knob.

Utility Flood Light

A portable utility floodlight is provided and is normally stowed on a bracket above the right console. An alligator clip attached to the light may be used to fasten the light at various locations in the cockpit at the pilot's discretion. The utility light is the only cockpit light designed to illuminate the cockpit which operates from JFS generator power.

Standby Instrument Lights

Lighting for the standby compass, the standby altimeter, the standby airspeed indicator and the standby attitude indicator are controlled by an individual toggle switch labeled STBY INST. Dimming control is provided by the AUX INST lights knob, which provides variable lighting between positions OFF and BRT.

Warning/Caution Lights Control Knob

A control is provided on the interior lights control panel to switch the warning/caution/BIT/advisory lights from bright intensity to the low intensity range, and then to vary the brightness within the low intensity range. The control is labeled WARNING CAUTION. The control only works provided the flight instrument lights knob is not in OFF, the storm/flood lights knob is not in full BRT, and the warning/caution lights control knob has been momentarily placed to the RESET position. Once in the low intensity range, the warning/caution/BIT/advisory lights can be brought back to bright intensity by turning the flight instrument lights knob to OFF, turning the storm/flood lights knob to full BRT, or removing and re-applying power to the aircraft. The master caution light is also dimmed when the warning caution lights knob is placed to RESET, but intensity cannot be varied.

Lights Test Switch

A lights test switch, labeled LT TEST, is provided to test the warning/caution/BIT/advisory lights.

OFF	The switch is spring loaded off.
ON	Serviceable warning/caution/BIT/advisory lights will illuminate (except T.O. TRIM).

OXYGEN SYSTEM

NORMAL OXYGEN SUPPLY

The normal system pressure is 70 psi with a usable pressure range of 55 to 90 psi. When the system is not operating (pilot not using system oxygen) the allowable pressure range is 55 to 120 psi. The pressure should remain within these limits until the converter is depleted.

Oxygen Low Caution Light

The OXY LOW light on the caution light panel comes on when oxygen quantity is below 2 liters. The light also comes on with the oxygen quantity test button depressed when the oxygen quantity gage pointer drops below 2 liters.

EMERGENCY OXYGEN SUPPLY

A 10 minute supply of oxygen is furnished by a gaseous oxygen storage bottle on the left rear of the ejection seat. The supply is activated automatically on ejection, or is activated manually by pulling the emergency oxygen green ring just forward of the bottle on the left seat arm rest.

OXYGEN REGULATOR

The oxygen regulator, on the right console, automatically controls the pressure and flow rate of normal oxygen based on demand and cockpit altitude.

Supply Lever

A two-position lever on the right corner of the regulator panel, controls the flow of oxygen from the regulator.

ON	The proper mix of cockpit air and oxygen is supplied to the mask.
OFF	Breathing is not possible with the mask on.

Diluter Lever

A two-position diluter lever, in the center of the regulator, controls the mixture of air and oxygen.

NORMAL	The scheduled mixture of air and oxygen is delivered.
100%	Pure oxygen is delivered.

Emergency Lever

A three-position emergency lever is on the lower left corner of the regulator panel.

NORMAL	Normal operation is provided.
EMERGENCY	Continuous positive pressure oxygen is delivered to the mask.
TEST MASK	Positive oxygen pressure is supplied.

Oxygen Flow Indicator

The oxygen flow indicator on the regulator alternately shows white for flow and black for no-flow with each breath under normal conditions. Continuous black indicates no air/oxygen is being furnished and continous white indicates a leak in the system.

Oxygen Pressure Gage

The oxygen pressure gage on the regulator indicates oxygen delivery pressure to the regulator. The normal indication is approximately 70 PSI.

Oxygen Quantity Gage

The oxygen quantity gage, is on the ECS panel adjacent to the regulator.

Oxygen Quantity Gage Test Button

The oxygen quantity gage test button, on the ECS panel, tests the operation of the gage and the OXY LOW caution light. Depressing the test button causes the gage needle to rotate from the present quantity indication to 0. As the needle passes below 2 liters the OXY LOW caution light should come on. Upon release of the test button, the gage needle should rotate from 0 to an indication of the present quantity. The OXY LOW caution light should go out as the needle passes above 2 liters.

Oxygen Hose Stowage Fitting

An oxygen hose stowage fitting is provided above and outboard of the right console. The oxygen hose should be stowed in this fitting at all times when not in use to prevent hose contamination and damage to the console by a flailing hose.

EMERGENCY EQUIPMENT

WARNING/CAUTION/BIT/ADVISORY LIGHTS

The warning lights provide indications of system malfunctions and important information to be noted. They illuminate red and are prominently located at or near the top of the instrument panel. Corrective action deenergizes all warning indications. The yellow caution lights also provide indications of system malfunctions and information to be noted. The caution lights are on the caution lights panel on the lower right sub-instrument panel. Cooling circuitry will cause the lights to blink if they are illuminated for long periods of time and become overheated. The MASTER CAUTION light on the upper instrument panel illuminates simultaneously when any caution light comes on, except for the following lights: AV BIT, JFS LOW, SPD BK OUT and the SPARE light. The SPARE light, between the PITCH RATIO and CAS YAW lights, is used as the IFF mode 4 caution and the IFF MODE 4 light is inoperative. After TO 1F-15-771, the IFF MODE 4 light is functional (SPARE light is inoperative) and the MASTER CAUTION light comes on with the IFF MODE 4 light. The MASTER CAUTION light extinguishes when it is depressed but, except for the HYDRAULIC and AUTO PLT lights, the caution light on the caution lights panel remains on until the malfunction is corrected. The advisory lights, which are either green or white, indicate safe and normal conditions and impart information for routine purposes. Individual advisory lights are located throughout the cockpit and are described with their applicable equipment. The BIT lights are described in built-in-test (BIT), this section. A list of warning/caution lights with causes of their illumination and corrective action-taken is described in Section III. Intensity control of the lights is described in lighting, this section.

VOICE WARNING SYSTEM (BEFORE TO 1F-15-857)

A voice warning system is activated if either engine FTIT exceeds 1000°C, the left or right ENG FIRE PUSH or AMAD FIRE PUSH (flashing or steady), or the FUEL LOW lights come on. The voice states: "Warning - Warning" pause "Warning - Warning" and will not continue to repeat. However, if a condition that activates the voice warning system is corrected and the same condition occurs again or any other condition occurs, the voice warning system will again be activated. If the condition is not corrected, the remaining lights or FTIT indicator(s) (as applicable) must be monitored. The voice warning system volume cannot be adjusted. Voice warning for the AMAD fire/overheat detection system and the FTIT indicators first becomes effective with application of external power, or with JFS operation during first engine start. Voice warning for the engine fire/overheat detection system and the fuel low level detection system first becomes effective with application of external power, or with the emergency generator coming on the line during first engine start.

VOICE WARNING SYSTEM (AFTER TO 1F-15-857)

A voice warning system is activated if either FTIT exceeds 1000°C, a fire condition (not overheat) causing the left or right ENG FIRE PUSH or AMAD FIRE PUSH light (steady) to come on, or conditions exist causing the following lights to come on: BINGO FUEL or FUEL LOW. For an FTIT overtemperature condition the voice states: "WARNING, FTIT OVERTEMP LEFT" or "WARNING, FTIT OVERTEMP RIGHT", pauses, then repeats once more. For an engine/AMAD fire condition the voice states: "WARNING, ENGINE FIRE LEFT" or "WARNING, ENGINE FIRE RIGHT" or "WARNING, AMAD FIRE", pauses, then repeats once more. For a BINGO fuel state the voice states: "WARNING, BINGO FUEL", pauses, then repeats once more. For a low fuel condition, the voice states: "WARNING, FUEL LOW", pauses, then repeats once more. Once given, the warnings will not repeat again unless the condition causing the voice warning system to activate is corrected and the condition subsequently recurs. In the case of a low fuel condition, the warning, once given, is locked out for one minute before it is allowed to repeat. The voice warning system volume cannot be adjusted. Voice warning for the AMAD fire detection system and the FTIT indicators first become effective with application of external power, or with JFS operation during first engine start. Voice warning for the engine fire detection system and fuel low level detection system first becomes effective with application of external power, or with the emergency generator coming on the line during first engine start.

OVERLOAD WARNING SYSTEM (AFTER TO 1F-15-655)

After TO 1F-15-655, an overload warning system (OWS) is provided. For the OWS to program properly, the external stores configuration, including external tanks, must be correctly set in the ACS/PACS. A 900 Hz tone is heard in the headset to give warning that the maximum allowable g is being approached. The tone is first heard at 85% maximum g and is interrupted at a rate of 4 Hz to produce a beeping sound. At 92% the tone is interrupted at a rate of 10 Hz, until at 100% the voice warning "OVER G, OVER G" is heard. The "OVER G, OVER G" continues until the overload condition of the aircraft is corrected. If the overload condition is relieved in the middle of an "OVER G" transmission, the transmission will be completed before the voice warning is discontinued. On aircraft F-15A/B, F-15C 78-0468 thru 79-0081 and F-15D 78-0561 thru 79-0014, before TO 1F-15-857, instead of a continuous "OVER G, OVER G", the voice warning "WARNING - WARNING" pause "WARNING - WARNING", is heard. The warning will not repeat unless the overload condition is relieved then is reapplied, should the overload condition be relieved when the warning is first heard, the full signal will be heard (taking approximately six seconds) although the overload is no longer on the aircraft.

The reliability of OWS is checked during VSD interrupted BIT. See built-in-test (BIT), this section. Inflight, OWS operation may be verified by display of both current g and maximum allowable g on the HUD.

VSD Display

When the aircraft is loaded to 85% or more of the design limit, the overload conditions are stored in the cc memory and can be recalled as an information matrix on the VSD. The overload conditions include normal acceleration in g's (ACC), the percent overload (OVL) and overload severity codes for selected components.

Figure 1-10A shows a typical OWS matrix. The procedure to display this matrix is contained in section II. .

The abbreviations used on the display are:

a. ACC- Normal accelertion load factor. This is a two or three digit number with a decimal before the last digit understood (e.g., 92 is read as 9.2g).

b. OVL - Percentage of overload expressed as a whole percentage. The percent overload is related to the component severity code as follows:

%OVL	SEVERITY CODE LEVEL
0% - 100%	0
100% - 110%	1
110% - 120%	2
120% - 130%	3
130% - 140%	4
140% and above	5

c. FUS - Fuselage

d. WNG - Wing

e. LTL - Left tail

f. RTL - Right tail

g. PYL - Pylon

h. CFT - Conformal fuel tanks

i. MIT - Mass items

The first line of the display shows the worst (highest) overload condition recorded during the flight. The second line is the latest overload condition encountered. Subsequent lines display overload percentages and severity codes for the listed components. This information is used to determine the required maintenance action. Note that there is an area of transitionary severity codes for each overload level. For example, a 100 on the display can be associated with a severity code of either 0 or , depending on the actual value of the overload, which is rounded for display. An overload value of exactly 100 will cause a 0 to be displayed, but a value of 100 plus any fraction will cause a 1 to be displayed. All applicable inspections are based on severity codes and not percent overload, which is displayed for information only.

Moving the DATA SELECT knot out of CCC or the DEST DATA out of M2 will return the normal display to the VSD. Stored entries equal to or less than 100% are automatically removed from the CC when the NCI mode switch is moved from ALIGN to NAV. Overloads over 100 % latch indicator 72 on the avionics status panel (ASP) and can only be cleared by setting the proper switches on the NCI and having maintenance personnel reset the ASP in the nose wheelwell. The procedure to clear the matrix is contained in section II.

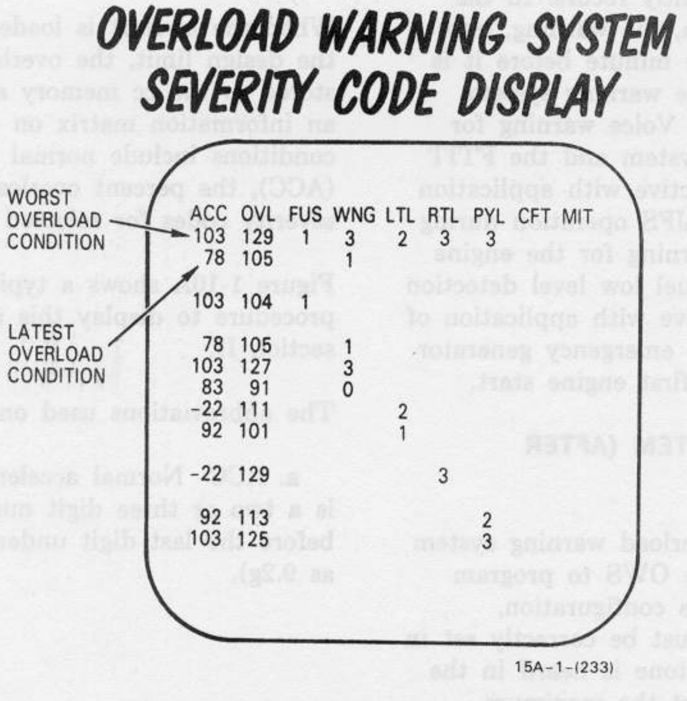


Figure 1-10A. Overload Warning System Severity Code Display

EMERGENCY JETTISON BUTTON

The emergency jettison button is located on the center of the instrument panel to the left of the ADI. This button, when pressed, will simultaneously jettison all pylons with cartridges installed and all AIM-7 missiles. Although the button is spring-loaded to the normal position, a means is provided to determine that the button is not stuck in the jettison position. In the normal position only the color black on the inside lip of the button guard can be seen above the button. If the button is stuck in the jettison position, yellow color can be seen in the switch guard below the black color.

CAUTION

Emergency jettison button is hot when electrical power is on the aircraft.

ARMAMENT SAFETY OVERRIDE SWITCH

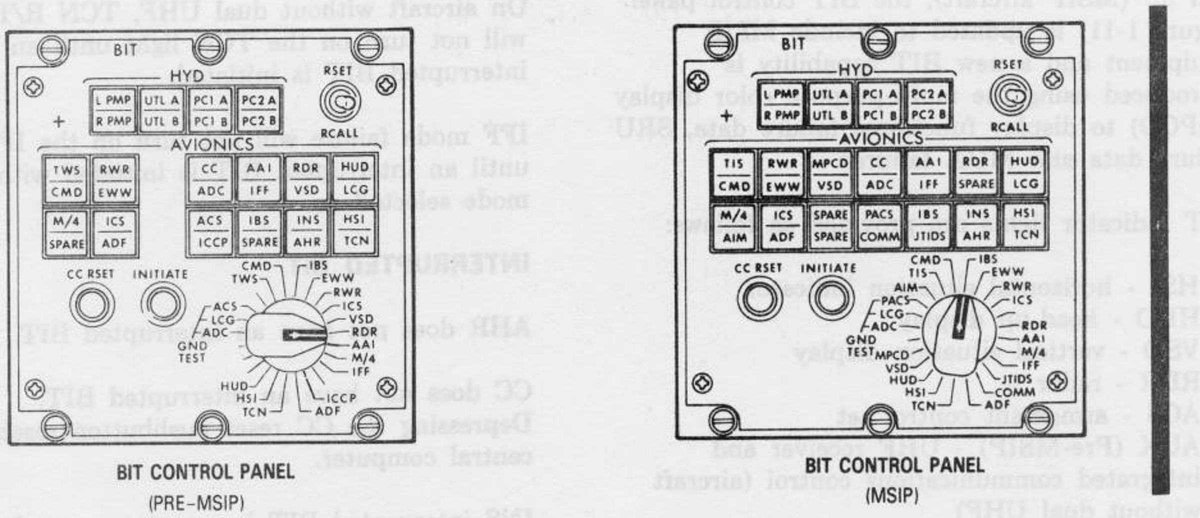
The armament safety override switch, on the left console outboard of the anti-g valve, allows the ground safety interlocks to be bypassed for armament circuit checkout.

SAFE	Normal circuitry is used.
OVERRIDE	The switch is solenoid held until electrical power is removed, the landing gear handle is placed UP, or the switch is manually placed to SAFE.

BUILT-IN-TEST (BIT) SYSTEM

The BIT control panel on the left console (figure 1-11) provides the controls and most cockpit indicators for the avionics built-in-test. Indicator lights for hydraulic subsystems are also on the panel (see hydraulic system, this section). Some cockpit units have a BIT failure indicator on the face of the unit. The indicator is normally black. It is either black and white or all white (depending on unit) if the unit malfunctions or fails BIT.

BIT CONTROL PANEL



BIT CONTROL PANEL
(PRE-MSIP)

BIT CONTROL PANEL
(MSIP)

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Figure 1-11. Bit Control Panel

Three test methods are used; continuous, interleaved and interrupted. The continuous method constantly monitors particular signals for presence, value or logic. The interleaved method automatically intersperses test signals and replies amongst operating signals in such a manner that they do not interfere with normal equipment operation. The interrupted method must be initiated by the pilot and causes an interruption of normal operation of the designated system for the duration of the test. Interrupted BIT initiations which drive displays to preset values may also drive displays other than those listed. Disregard these indications.

Failure to pass any BIT test causes the appropriate indicator light to illuminate steady, the appropriate equipment location indicator(s) on the avionics status panel in the nose wheelwell to latch, and the AV BIT light on the caution light panel, but not the master caution light, to illuminate. Illuminated BIT lights and the AV BIT light will go off when the reset/recall switch is actuated to RSET.

Previously illuminated lights will come on again when the switch is actuated to RCALL or if any other BIT light illuminates. The associated BIT light will be on if there is no power on the system but nose wheelwell indicators will not latch. Failure of BIT circuitry within a system will latch indicators in the nose wheelwell but the BIT panel light will not illuminate.

On F-15C 84-0001 and up and F-15D 84-0042 and up (MSIP aircraft), the BIT control panel (figure 1-11) is updated to include MSIP equipment and a new BIT capability is introduced using the multi-purpose color display (MPCD) to display functional failure data, SRU failure data and MUX failures.

BIT indicator lights are provided as follows:

HSI - horizontal situation indicator
HUD - head-up display
VSD - vertical situation display
RDR - radar
ACS - armament control set
AUX (Pre-MSIP) - UHF receiver and integrated communications control (aircraft without dual UHF)
ICCP (Pre-MSIP) - Integrated communications control panel (Replaces AUX switch position and light on aircraft with dual UHF)
TCN - tacan
ADF - automatic direction finder
LCG - lead computing gyro
IFF - IFF transponder and control panel
AAI - IFF reply evaluator, interrogator
M/4 - IFF reply evaluator, interrogator, control panel, transponder, KIT and KIR
RWR - radar warning receiver
ADC - air data computer
IBS - interference blanker set
ICS - internal countermeasure set
EWW - electronic warfare warning set
AHR - attitude and heading reference system
INS - inertial navigation system
CC - central computer
TWS (Pre-MSIP) - tail warning set
CMD - countermeasures dispenser
TIS (MSIP) - tactical information system
AIM (MSIP) - air intercept missile
MPCD (MSIP) - multi-purpose color display
COMM (MSIP) - communications
PACS (MSIP) - programmable armament control system
JTIDS (MSIP) - joint tactical information display system

AIC BIT failure indication is provided by the R INLET and L INLET lights on the caution light panel. There is no interrupted BIT for the air inlet controllers.

AFCS BIT failure indication is provided by the CAS YAW, CAS ROLL, and CAS PITCH lights on the caution light panel. There is no interrupted BIT for the AFCS.

On aircraft without dual UHF, TCN R/T failure will not turn on the TCN light until an interrupted BIT is initiated.

IFF mode failure will not turn on the IFF light until an interrupted BIT is initiated with the mode selected on.

INTERRUPTED BIT

AHR does not have an interrupted BIT.

CC does not have an interrupted BIT. Depressing the CC reset pushbutton resets the central computer.

INS interrupted BIT is a maintenance function.

Interrupted BIT, except INS, is initiated by selecting the function on the BIT select knob and depressing the initiate button. Do not move the selector until the test is completed. All previously reset BIT lights and the AV BIT light (if applicable) will illuminate when the initiate pushbutton is depressed. The associated light will blink during the test and extinguish at satisfactory completion of the test or illuminate steady for test failure. Most initiated tests require 2 seconds or less to complete and some are in the 100 millisecond range. When instrument readings must be noted, it may be necessary to hold the initiate pushbutton depressed until the reading is completed.

ACS, PACS, LCG and ADC interrupted BIT selection positions are marked GND TEST and interrupted BIT for this equipment is inhibited unless the weight-on-wheels switch is closed.

ACS or PACS interrupted BIT is a pre-loading maintenance function and should not be initiated by the pilot.

HSI interrupted BIT initiation drives the HSI display as follows:

Compass card - 020
Course arrow - 040
Bearing pointer 1 - 040
Bearing pointer 2 - 060
Range indicator - 1234
Course selector window - 040
Course deviation bar - 1/2 scale to right
To-from indicator - TO
OFF flag - out of view
Course deviation warning flag - in view

and the ADI display as follows:

Pitch steering bar - ½ scale up
Bank steering bar - ½ scale to right
Glide slope indicator - out of view
Glide slope warning flag - out of view

TCN interrupted BIT initiation, providing steermode knob is at TCN and the tacan mode knob is not OFF, drives the HSI display as follows:

Bearing pointer 1 - 000 (aircraft without dual UHF)
Bearing pointer 1 - 180 (aircraft with dual UHF)
Range indicator - 0000

ADC interrupted BIT initiation drives the flight instrument display as follows:

Airspeed - 250 knots
Mach - .465
Vertical velocity - 500 feet/minute climb
Altimeter - 11,500 feet (29.92)

AAI interrupted BIT, with code 0000 selected, causes the VSD to display four targets at 22.8° left and right and 6.8 and 27.4 miles range providing the radar mode select knob is at LRS and sufficient range is selected on the radar range knob.

IFF interrupted BIT should be initiated with all but one of the M1, M2, M3/A, and MC switches OUT. After the IFF light stops flashing these switches should be placed ON one at a time while observing the IFF light so that any failed mode can be isolated.

IFF mode 4 interrupted BIT does not display targets on the VSD. An ID OFF may be displayed and should be ignored. A valid mode 4 BIT is indicated by a flashing M/4 light (BCP panel), aural tone, and absence of the IFF MODE 4/SPARE caution light.

ICCP interrupted BIT on aircraft after TO 1F-15-857 is followed by the voice warning vocabulary (WARNING, FTIT, OVERTEMP, LEFT, RIGHT, ENGINE, FIRE, AMAD, LOW, FUEL, and BINGO. After TO 1F-15-655 and TO 1F-15-857, OVER G is added to the vocabulary). An ICCP interrupted BIT can produce a false BIT failure indication if a voice warning has been activated and the cause is uncorrected. For example, if an ICCP BIT check is initiated after a BINGO FUEL voice warning, the AV BIT and ICCP lights remain on after the check and the voice warning vocabulary is not heard in the headset. Removing the cause of the BINGO FUEL voice warning and re-initiating the BIT allows the test to be passed, provided the ICCP is not malfunctioning. An ICCP interrupted BIT can also produce a false indication if a signal is injected into the intercom during BIT such as background engine noise. On F-15B/D aircraft, selection of COLD MIC in both cockpits prior to initiated BIT test, or on F-15A/C aircraft, disconnecting the pilot's headset allows the test to be passed, provided the ICCP is not malfunctioning. The COMM interrupted BIT on MSIP aircraft is the same as the ICCP BIT after TO 1F-15-655 and TO 1F-15-857.

During VSD interrupted BIT after TO 1F-15-655, a display (figure 1-11A) on the VSD is used to check the reliability of the overload warning system. While holding the BIT initiate pushbutton pressed to keep the display on the VSD, move the control stick with the right hand and note that the stick force readout changes in proportion to the lateral stick inputs, left and right. Note also that the left and right stick forces agree for a given stick deflection. The OWS automatically reduces allowable load factor in proportion to lateral stick as the method of protecting the aircraft from asymmetric or rolling g. Due to different roll rates obtainable at subsonic versus supersonic speeds, the OWS is programmed for a max reduction in allowable load factor of 20% subsonic and 12% when supersonic. After checking stick forces, compare the fuel quantity display on the VSD display with the fuel quantity indicator. Normally the difference in fuel quantities is less than 100 pounds, but it should never exceed 800 pounds.

MPCD interrupted BIT is accompanied by the same test pattern on the MPCD as during the VSD interrupted BIT.

AIM, JTIDS and TIS interrupted BITs are not operational.

VSD BIT DISPLAY

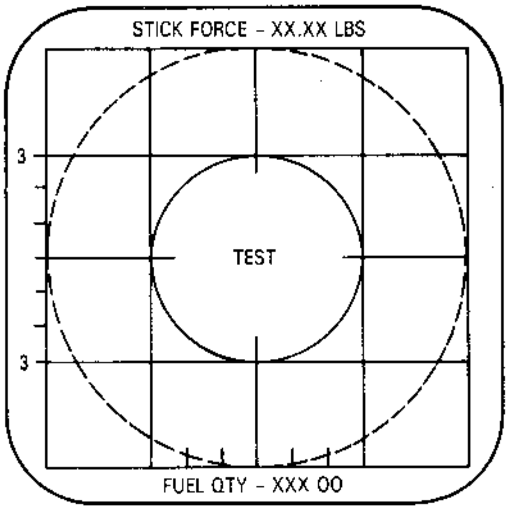

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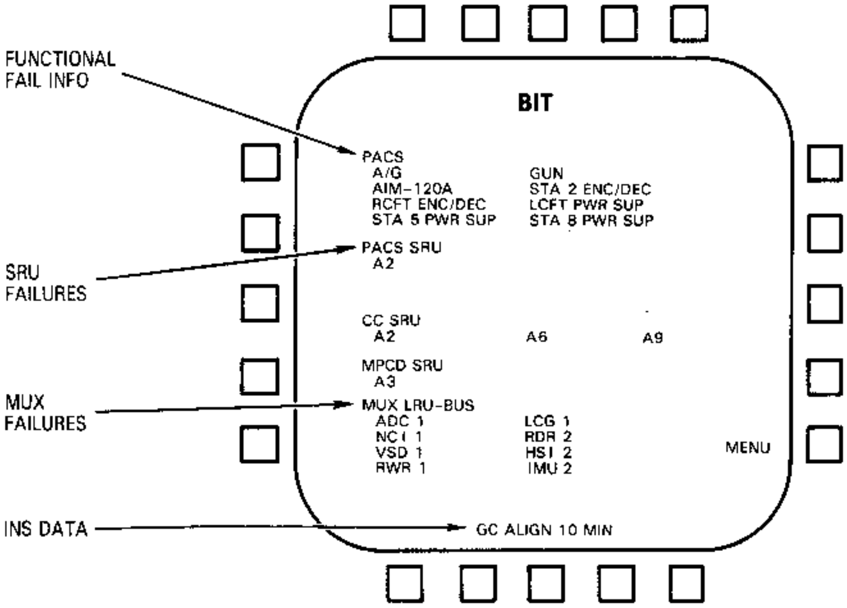
Figure 1-11A. VSD BIT Display

RDR interrupted BIT - Refer to TO 1F-15A-34-1-1 or TO 1F-15C-34-1-1.

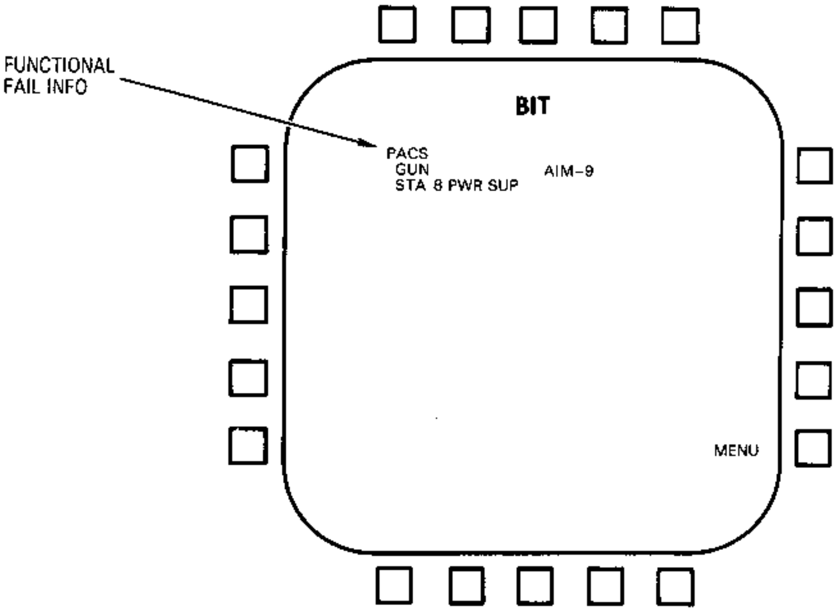
MSIP BIT

On F-15C 84-0001 and up and F-15D 84-0042 and up (MSIP aircraft) the MPCD can be used to select and display MSIP BIT information beyond the GO, NO-GO indication on the BIT control panel. MSIP BIT is selected from the system menu display (figure 1-11C) by pressing the BIT select button on the MPCD. If the aircraft is on the ground the following information is displayed (figure 1-11B); PACS funtional failure data; PACS, CC and MPCD SRU (shop replaceable unit) failure data; MUX LRU BUS failure data; and INS alignment mode data. If the aircraft is inflight only functional failure data is displayed. If no failures are present after MSIP BIT is selected, only the MENU legend and BIT are displayed on the MPCD. Only current data received from the equipment is displayed. If the equipment is turned off or has failed completely no data is displayed. SRU fail data from the CC is limited, since the CC normally shuts down when a NO-GO is detected. SRU fail data from the MPCD also is limited, but if the MPCD is capable of displaying alphanumeric legends; the SRU failures will be displayed. CC SRU fail data is preserved in memory, but PACS and MPCD SRU fail data is not. Prior to MSIP, mux failures could only be read out on the NCI. On MSIP aircraft they are displayed on the ground below the SRU failure data. The mux failures and INS alignment mode data are automatically cleared from the CC at next INS alignment.

MSIP BIT DISPLAY



AIRCRAFT ON GROUND



AIRCRAFT AIRBORNE

Figure 1-11B.

INSTRUMENTS

Refer to foldout section for cockpit instrument panel illustrations. For information about instruments that are an integral part of a system, refer to applicable paragraphs in this section.

AIRSPEED/MACH INDICATOR

A combination calibrated airspeed and Mach number indicator is on the instrument panel. A fixed airspeed scale graduated from 50 to 1000 knots and a rotating Mach number scale, synchronized so that their correct relationship is displayed through all altitudes, enable a single pointer to indicate both readings. Only airspeed is displayed below 200 knots. A movable index mark and an index set knob are provided. The indicator operates from electrical signals from the air data computer. Windows on the instrument will display an OFF flag if electrical power is lost or the display is not valid, or a MACH flag if the mach display is not valid.

STANDBY AIRSPEED INDICATOR

The standby airspeed indicator operates directly from pitot-static pressures. It has a fixed scale of 60 to 850 knots and a rotation pointer.

ALTIMETER

The altimeter is driven by electrical signals from the air data computer. The indicator is a counter-pointer type. A window on the face of the dial provides a digital readout of altitude in 20 'foot increments. An OFF flag will be displayed in this window if electrical power is lost or the display is not valid.

STANDBY ALTIMETER

The standby altimeter operates directly from a static pressure source.

STANDBY MAGNETIC COMPASS

A conventional aircraft magnetic compass is mounted on the canopy arch.

VERTICAL VELOCITY INDICATOR

The vertical velocity indicator is driven by electrical signals from the air data computer. A window on the instrument will display an OFF flag if electrical power is lost or the display is not valid.

ACCELEROMETER

The accelerometer measures and displays instantaneous positive and negative normal acceleration g loads and records the maximum positive and negative loads occurring since the instrument was last reset. Accelerometer g loads are measured at the instrument and are not as accurate as HUD-displayed g loads.

STANDBY ATTITUDE INDICATOR

The standby attitude indicator is a self-contained electrically driven gyro-horizon type instrument. The OFF flag appears if there is a power loss to the indicator or the gyro is caged. The gyro is caged by pulling the knob. Do not turn the knob to lock the gyro in the caged position. The gyro cages to 0° pitch and roll regardless of airplane attitude. The caged position is approximately 4° nose up from the normal ground attitude and the gyro will precess 4° nose down after uncaging. Power should be applied to the instrument for at least 1 minute before caging. The indicator displays roll through 360°. Pitch display is limited by mechanical stops at 90° climb and 78° dive. As the aircraft climbs or dives, the pitch attitude changes smoothly until the stop is reached when the gyro tumbles 180° in roll.

ANGLE OF ATTACK (AOA) INDICATOR

The AOA indicator is driven by electrical signals from the probe and displays indicated AOA in units from 0 to 45. A T-shaped index mark is set at approximate optimum landing approach AOA (20 to 22 units). A window on the face of the instrument displays an OFF flag if electrical power is lost. A triangular index mark is positioned full scale and is inoperative.

MULTI-PURPOSE COLOR DISPLAY

On F-15C 84-0001 and up, and F-15D 84-0042 and up, the multi-purpose color display (MPCD) allows the pilot to view and control the weapon BIT, armament or data transfer module systems. The various controls on the MPCD control panel (figure 1-11C) control the functional parameters in which the MPCD operates. Power is applied by rotating the MPCD power knob to the NIGHT or DAY position. Approximately 8 seconds is required for MPCD warm-up. Upon initiation of power the MPCD displays the last mode that was selected before power down. System menu (figure 1-11C) is displayed after MPCD interrupted BIT or by pressing the lower right select button on the control panel. MENU is normally displayed adjacent to the lower right select button, unless system menu is selected. From system menu, the ARMT, BIT, WPN and DTM menus can be selected. For description of the use of these menus, refer to the appropriate system in this publication and TO 1F-15C-34-1-1. The MPCD displays utilize the following colors: green, amber, cyan (greenish blue) and white.

MULTI-PURPOSE COLOR DISPLAY (MPCD) CONTROL PANEL

(MENU DISPLAY SELECTED)

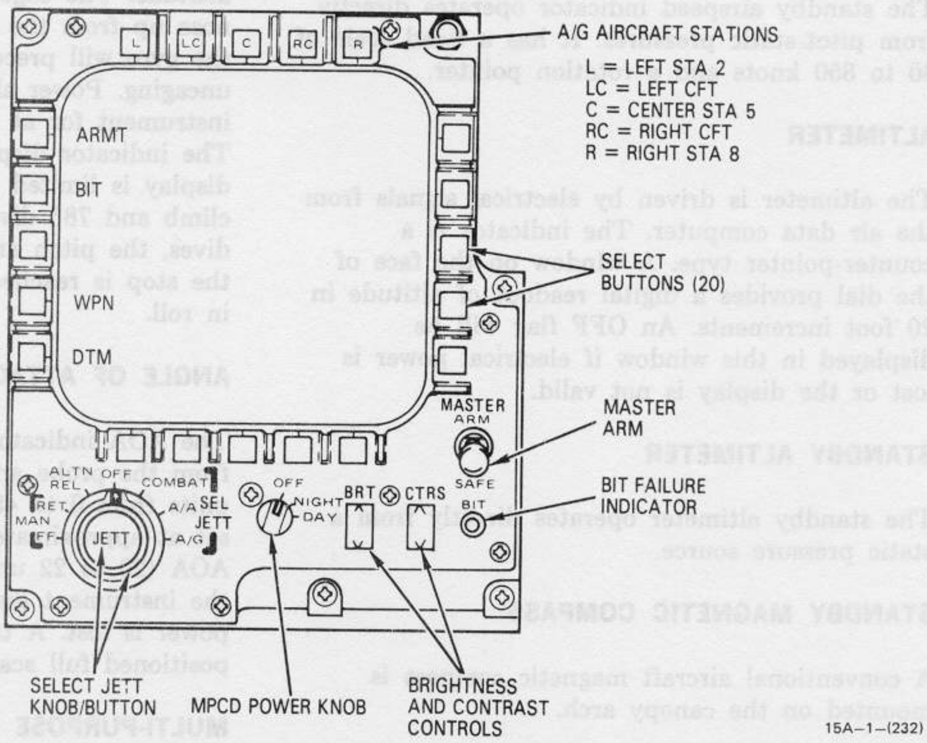


Figure 1-11C. Multi-Purpose Color Display (MPCD) Control Panel

ATTITUDE DIRECTOR INDICATOR

The indicator (figure 1-12) consists of the items indicated. The attitude sphere displays pitch and bank. The pitch markings on the sphere are in graduations of 5°, the bank markings are in graduations of 10° with the large markings indicating each 30°. Signals are received from the INS or AHRS attitude reference system. Either system can be selected by placing the attitude reference system selector knob to the desired position. If bus power to the indicator is lost, the indicator automatically selects AHRS as the source of attitude reference, bypassing the attitude reference selector knob. The pitch trim knob is used to adjust the sphere to indicate zero pitch when the aircraft is pitched to the desired attitude. The pitch and bank steering bars are driven by signals from the CC. The bank steering bar provides command steering information to intercept tacan radials and navigation computer destinations. The bank steering bar and glideslope indicator are used in conjunction with the instrument landing set (ILS). The course warning flag or glideslope warning flag appear in view if the bank steering bar or glideslope indicator displays are unreliable because of a lost or weak signal. The ADI provides continuous BIT monitoring. The OFF warning flag on the indicator comes into view if power to the unit is lost, if there is a loss of synchro signal to the pitch or roll servo, if there exists an excessive servo error, or if the ADI is receiving an invalid signal.

HORIZONTAL SITUATION INDICATOR (HSI)

The HSI (figure 1-12) provides a horizontal or plan view of the aircraft with respect to the navigation situation. The aircraft symbol in the center of the HSI is the airplane superimposed on a compass rose. The compass card rotates so that the aircraft heading is always under the top of the lubber line. Index marks are provided every 45° around the perimeter of the compass card. Four modes of navigational operation are displayed on the HSI. These modes are selected by the steering mode knob (see figure 1-13).

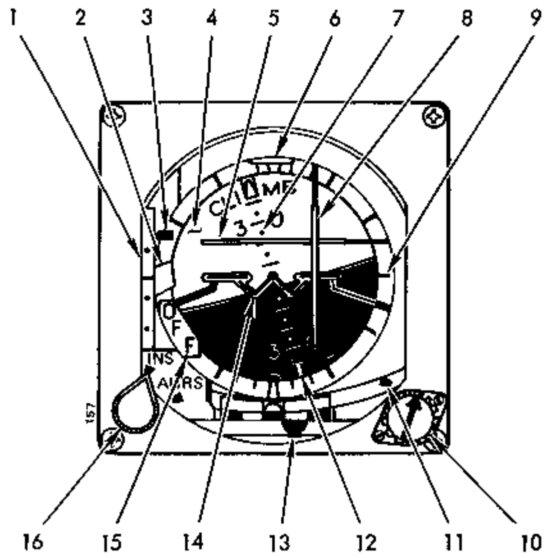
Steering Mode Panel

The steering mode panel is on the main instrument panel, adjacent to the ADI. The panel contains a steering mode knob which selects the source of information or mode to be displayed on the HSI, ADI, and HUD (with ADI master mode selected) as shown in figures 1-14 and 1-15.

NAV	Selects navigation computer mode.
TCN	Selects tacan mode.
ILS/NAV	Selects ILS with navigation information displayed.
ILS/TCN	Selects ILS with tacan information displayed.

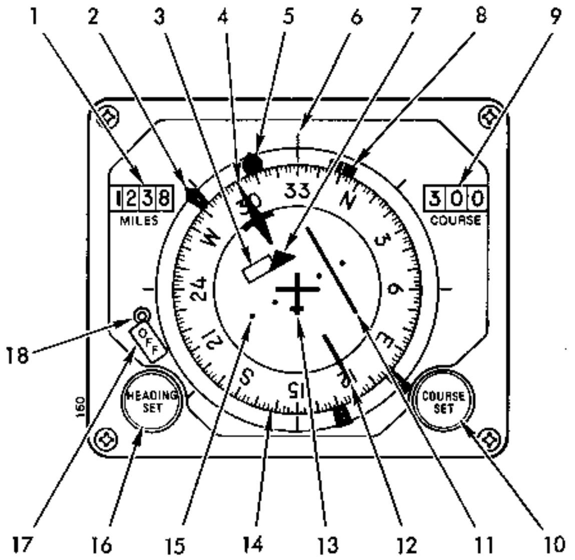
ADI/HSI

ADI



1. GLIDE SLOPE DEVIATION SCALE
2. GLIDE SLOPE WARNING FLAG
3. GLIDE SLOPE INDICATOR
4. ATTITUDE SPHERE
5. PITCH STEERING BAR
6. COURSE WARNING FLAG
7. PITCH SCALE
8. BANK STEERING BAR
9. BANK SCALE
10. PITCH TRIM KNOB
11. PITCH TRIM INDEX
12. BANK POINTER
13. TURN AND SLIP INDICATOR
14. MINIATURE AIRCRAFT
15. POWER OFF WARNING FLAG
16. ATTITUDE REFERENCE SELECTOR KNOB

HSI



1. RANGE INDICATOR
2. BEARING POINTER NO. 1
3. COURSE DEVIATION WARNING FLAG
4. COURSE ARROW (HEAD)
5. BEARING POINTER NO. 2
6. LUBBER LINE
7. TO-FROM INDICATOR
8. HEADING MARKER
9. COURSE SELECTOR WINDOW
10. COURSE SET KNOB
11. COURSE DEVIATION INDICATOR
12. COURSE ARROW (TAIL)
13. STATIONARY AIRCRAFT SYMBOL
14. COMPASS CARD
15. COURSE DEVIATION SCALE
16. HEADING SET KNOB
17. POWER OFF FLAG
18. BIT LATCH INDICATOR

15A-1-(26)A

Figure 1-12

HSI DISPLAYS

SYMBOL	NAV MODE	TCN MODE	ILS/NAV MODE	ILS/TCN MODE
BEARING PTR. NO. 1	TCN MAGNETIC BEARING ADF RELATIVE BEARING IS DISPLAYED IF ADF IS ON			
BEARING PTR NO. 2	DEST/TGT MAGNETIC BEARING			
COMPASS CARD	MAGNETIC HEADING			
RANGE INDICATOR	DEST/TGT DISTANCE	TCN DISTANCE	DEST/TGT DISTANCE	TCN DISTANCE
COURSE SELECTOR WINDOW	MAGNETIC TRACK	COURSE SET (TCN RADIAL)	COURSE SET (RUNWAY/APPROACH HEADING)	
COURSE ARROW	MAGNETIC TRACK	COURSE SET (TCN RADIAL)	COURSE SET (RUNWAY/APPROACH HDG)	
HEADING MARKER	COMMAND HEADING	HEADING SET		
TO/FROM INDICATOR	OUT–OF–VIEW	TO/FROM TCN STATION	OUT–OF–VIEW	
COURSE DEVIATION INDICATOR	HEADING DEVIATION (10° MAX DEV)	TCN DEVIATION (10° MAX DEV)	LOCALIZER DEVIATION (2 1/2° MAX DEV)	
COURSE DEVIATION WARNING FLAG	OUT–OF–VIEW IF DEVIATION VALID		OUT–OF–VIEW IF LOCALIZER VALID	

15A–1–(25)C

Figure 1-13

NAVIGATION HEAD-UP DISPLAYS (HUD)

The design eye position for the HUD, on the main instrument panel, is established by adjusting the seat to align the eye line of sight with the top of the HUD box/glareshield. The HUD displays the following aircraft parameters in all modes of the avionics system: magnetic heading, indicated airspeed, barometric altitude, velocity vector, pitch scale, aircraft symbol, and (in air-to-air modes) aircraft Mach. The aircraft load factor to the nearest tenth of a g is displayed in all modes except VI, and this reading is limited to 8 g. After TO 1F-15-655, the HUD displays both current and maximum allowable g for existing flight conditions, aircraft configuration, and gross weight. Current g is displayed on the left and maximum allowable g is displayed on the right. The maximum allowable display changes automatically as flight conditions and gross weight changes. The g displays do not use decimal points, the letter g, nor plus or minus signs. If the overload warning system fails, the g display reverts to the pre-overload warning system display. The aircraft is also equipped with a provision to cage the velocity vector symbol in the ADI mode. When the ADI mode is initially selected, the velocity vector is positioned at the correct position. Flashing of the velocity vector indicates that the symbols actual position is out of the HUD field of view. Depressing and releasing the stiffen/reject button on the throttle centers the velocity vector and pitch scale in azimuth. A subsequent depression again frees the symbols in drift. The caged (centered) velocity vector will flash whether or not the symbols actual position is out of the HUD field of view. In all navigation steering modes the heading, airspeed, altitude, angle of attack, and pitch scales symbology can be removed by placing the HUD symbol switch on the HUD control panel to the reject position. In addition to the flight parameters, the HUD displays navigational data if the avionics system is in the ADI mode. The ADI mode is selected by positioning the weapon select switch on the throttles to any position other than gun, and depressing ADI switch on the master mode panel. In NAV (navigation) mode, in addition to the flight parameters, the HUD displays bank steering to the destination selected, time-to-go and range to destination, steering mode selected, and nav destination selected. In TCN (tacan) mode, the HUD displays are the same as in NAV mode except that the bank steering displayed is to the selected tacan radial, the time-to-go and range displayed is to the tacan station, and destination is not displayed. In ILS/NAV and ILS/TCN (instrument landing set) modes, in addition to the flight parameters, the HUD displays the following: bank and pitch steering bars for approach and landing on runway destination, time-to-go and range to destination (in ILS/NAV) or tacan station (in ILS/TCN), the steering mode selected, and the GSUP and GSDN symbols for glide slope steering. Time-to-go is displayed to the nearest minute with a maximum reading of 99 minutes. Also when the steering mode knob is in either the ILS/NAV or ILS/TCN mode and the aircraft passes over the outer marker or middle marker beacon, the beacon light will flash and MKR will flash on the HUD. Range to the nearest tenth of a nautical mile is displayed on the HUD for any mode selected on the steering mode panel. When the gear is down, in ADI mode, angle-of-attack data in cockpit units is displayed on the HUD, the altitude scale is expanded to twenty foot increments, and all the HUD window symbols and the airspeed and altitude scales on the HUD display are lowered to reduce pilot look angles from the velocity vector to the scales.

VIDEO TAPE RECORDING SYSTEM (VTRS) (AFTER TO 1F-15-817)

A video tape recording system (VTRS) is installed with capability of recording the display on either the HUD or the VSD. On MSIP aircraft a split screen presentation of both the HUD and VSD can be recorded. Maximum recording time is 30 minutes. The system can record continuously or it can be made to record only when the control stick trigger switch or weapons release button is pressed. The VTRS can be made to generate video and audio event marks which are recorded to indicate actuation of the weapons release button or the trigger switch to the second detent. The system consists of two video cameras mounted in front of the HUD and above the VSD, a video tape recorder, a video tape recorder panel, and associated circuits and controls. A beamsplitter, mounted on the VSD, displays and reflects the display up into the camera while allowing the pilot to view the display normally. With the beamsplitter installed the VSD ambient light sensor is covered and the VSD automatic contrast control is inhibited. The VSD contrast must be adjusted manually.

VTRS CONTROLS AND INDICATORS

The controls for VTRS operation are on the video tape recorder panel and the head up display control panel. Both panels are on the main instrument panel. The controls on the video tape recorder panel are the camera selector switch, the video record switch, and the minutes remaining indicator reset knob. The control on the head up display control panel is the HUD camera switch. The only indicator for the VTRS is the minutes remaining indicator on the video tape recorder panel.

Camera Selector Switch

The camera selector switch selects which video camera is to be used for recording by the VTRS.

HUD	HUD display is recorded when VTRS records.
BOTH	On MSIP aircraft, the HUD and VSD displays are selected for split screen recording on the VTRS. On aircraft without MSIP, only the HUD is recorded in the BOTH position.
VSD	VSD display is recorded when VTRS records.

Video Record Switch

Controls warm up power for system and, in conjunction with the HUD camera switch, commands system to record either continuously, or during actuation of the control stick trigger switch or the weapons release button.

OFF	System will not record. Once the video record switch has been placed to STBY, power must remain on the aircraft for 10 seconds after switching to OFF to permit the tape cassette to unthread. If the tape is not unthreaded the cassette cannot be removed from the VTRS.
STBY	When switched from OFF to STBY, power is applied to the VTRS, and after approximately 10 seconds the tape cassette is threaded to ready the system for recording. With HUD camera switch in RUN, system records continuously. With HUD camera switch in TRIG, system records when the control stick trigger switch is pressed to the 1st detent. With HUD camera switch in TRIG and the master arm switch in ARM, the VTRS records and generates event marks when the control stick trigger switch is pressed to the 2nd detent or the weapons release button is pressed. System will record an additional 5 seconds after the trigger switch is released from the 2nd detent. After the weapons release button is released, the VTRS records for a period equal to the computed missile time-of-flight plus 1 second.
ON	VTRS records continuously. Event markers are generated with the same switch settings as when in STBY.

AUTO (MSIP only)	This position activates the VTRS. With the HUD camera switch set to OFF, the VTRS records video display as selected on the camera selector switch. With the HUD camera switch set to RUN, only HUD display video is recorded. With the switch set to TRIG, the type of video recorded is as selected on the camera selector switch until either the trigger switch or weapons release button is pressed. During this time, HUD video is recorded.

HUD Camera Switch

The HUD camera switch, a control left over from the previously removed HUD camera, is used to enable the recording function of the VTRS when the video record switch is in the STBY position, and enables the event marker function when the video record switch is in either the STBY or ON positions.

OFF	Recording function of the VTRS is disabled with video record switch in STBY.
RUN	VTRS records continuously with video record switch in STBY.

TRIG	Enables VTRS to record with video record switch in STBY providing the control stick trigger switch or the weapons release button is pressed and the master switch is in ARM (not required for 1st detent position of trigger switch). Also enables event marker generation with the video record switch in either STBY or ON, providing the master arm switch is in ARM.

Minutes Remaining Indicator and Reset Knob

The minutes remaining indicator indicates minutes of recording time remaining. The indicator is capable of displaying any number from 00 through 99 although the maximum recording time of the VTRS is 30 minutes. The indicator is reset by pressing the reset knob and then twisting the knob to the right or left. Each time a fresh video tape cassette is installed the indicator should be reset to 30.

Night Filter

A night filter is provided to be installed in the beamsplitter at night so that the intensity of the VSD display can be turned up to allow recording without excessively increasing cockpit illumination. During the day when the night filter is not being used it should be stowed in the pouch on the map and data case.

ATTITUDE HEADING REFERENCE SET (AHRS)

The attitude heading reference set supplies aircraft magnetic heading to various avionic systems. The AHRS is also the standby system which provides attitude (roll and pitch) information if the primary (INS) system fails. AHRS attitude is displayed on the ADI when AHRS is selected on the attitude reference selector knob. With the attitude reference selector knob in AHRS during INS alignment, completion of AHRS heading system alignment is indicated when the ADI OFF flag disappears from view.

AHRS INTERFACE

The INS provides roll and pitch data to the radar set and to the HUD. The AHRS provides INS with magnetic heading. The AHRS is informed by the INS of INS attitude validity. If INS attitude is invalid, the AHRS sends attitude information to the radar set and HUD. The INS provides compass mode command to AHRS, forcing AHRS into compass mode during INS alignment. The AHRS provides the central computer with magnetic heading at all times and informs the computer when the AHRS is in the slaved mode of operation. The AHRS sends roll and pitch information to the central computer. The AHRS supplies magnetic heading to the HSI to position the compass card, and provides roll and pitch information to the ADI when AHRS is selected.

COMPASS CONTROL PANEL

The compass control panel, on the right console, provides the necessary controls to operate the gyromagnetic compass system. These controls are the sync indicator meter, push to sync knob, fast erect pushbutton, hemisphere switch, latitude control knob, and the mode selector knob.

Sync Indicator Meter

The sync indicator meter indicates the direction (plus or minus) between the AHRS directional gyro and the magnetic azimuth detector, in the slaved mode.

Push To Sync Knob

The push to sync knob is a combination push to sync and push to turn (set heading) knob. When the knob is depressed and the mode selector knob is in SLAVED position, the AHRS provides fast synchronization of the gyro stabilized magnetic heading output to the magnetic azimuth detector. When the mode selector knob is in DG position, depressing and rotating the push to sync knob will slew the AHRS heading output through 360° of rotation (on the compass card). Rotating the push to sync knob causes the HSI compass card to rotate while the heading on the HUD remains steady.

Fast Erect Pushbutton

Depressing the fast erect pushbutton causes the AHRS pitch and roll erection loops to revert to the fast erection rate. If the aircraft is in unaccelerated flight and there is an obvious disagreement between the attitude indicator and the visually verified attitude of the aircraft, go to straight-and-level unaccelerated flight and momentarily depress the fast erect pushbutton to re-erect the gyro for correct attitude sensing. During the fast erect condition the AHRS will indicate invalid BIT outputs, and level, unaccelerated flight must be maintained until a valid output is obtained.

Hemisphere Switch

The hemisphere switch selects the northern (N) or southern (S) hemisphere for operation of AHRS.

Latitude Control Knob

The latitude control knob manually inserts present position latitude, in DG and slaved mode, so that the AHRS can determine the correction needed for gyro drift due to the earths rotation.

Mode Selector Knob

The mode selector knob is a three-position rotary knob with positions of COMP, DG, and SLAVED. The SLAVED mode is normally used. In the SLAVED mode, directional gyro sensed heading is continuously corrected to the heading sensed by the magnetic azimuth detector and the resultant is transmitted to other aircraft systems. The COMP mode is usually selected only when there is a gyro malfunction. In the COMP mode, the reading sensed by the magnetic azimuth detector is transmitted to other aircraft systems. The DG mode is used in latitudes higher that 70° or where the earth magnetic field is appreciably distorted. In the DG mode, the directional gyro heading is transmitted to other aircraft systems. When the DG mode is initially selected, the aircraft magnetic heading must be set into the system with the PUSH TO SYNC knob on the compass control panel. The system then uses this reference for subsequent heading indications. In the SLAVED and DG modes, apparent drift compensation is inserted with the hemisphere (N-S) switch and the latitude control knob on the compass control panel. When in either of these modes, periodically check that the hemisphere and latitude settings correspond with the actual latitude.

COMP	Heading sensed from the magnetic azimuth detector
DG	Heading sensed from the directional gyro
SLAVED	Heading sensed from the directional gyro continuously corrected by the magnetic azimuth detector.

TACAN (TACTICAL AIR NAVIGATION) SYSTEM

The tacan system functions to give precise air-to-ground bearing and distance information at ranges up to approximately 300 miles (depending on aircraft altitude) from an associated ground or shipboard transmitting station. It determines the identity of the transmitting station and indicates the dependability of the transmitted signal.

When operating in conjunction with aircraft having air-to-air capability, the A/A mode provides line of sight distance between two aircraft operating their tacan sets 63 channels apart. Up to five aircraft can determine line of sight distance from a sixth lead aircraft in the A/A mode, provided their tacan sets are set 63 channels apart from the lead aircraft. The limit of operation is four times the distance between the lead aircraft and the nearest aircraft. The lead aircraft will indicate distance from one of the other five, but it cannot readily determine which one. Before operating in the A/A mode, the frequencies used by each aircraft must be coordinated. Tacan information except in A/A mode is presented on the horizontal situation indicator (HSI), the attitude director indicator (ADI), and the head-up display (HUD). In A/A mode, both distance and bearing are received if cooperating aircraft (such as refueling tanker aircraft) have bearing transmission capability.

TACAN CONTROLS

The controls for tacan operation are on the ILS/tacan control panel on the left console, on the steering mode panel on the main instrument panel, and on the HSI. The controls on the ILS/tacan control panel are the function selector knob, the volume control knob, the channel selector knob, and the XY switch. The controls on the steering mode panel consist of the steering mode knob. The controls in the HSI are the course set knob and the heading set knob.

Function Selector Knob

The function selector knob is a three-position rotary knob used for selecting tacan modes of operation. The mode positions are marked A/A, T/R, and REC.

T/R	Tacan receives bearing signals from the tacan ground station, and in addition, the tacan interrogates the tacan ground station to establish distance from the aircraft to the ground station. The bearing and distance information is displayed on the HSI.
REC	Tacan receives bearing signals from the tacan ground station for bearing display on the HSI, and also for steering display on the ADI and HUD. Tacan distance readout is shuttered on the HSI.
A/A	Tacan interrogates other aircraft which contain a tacan in the A/A mode and tuned 63 channels apart from the channel setting of the interrogating aircraft. Bearing and distance information is received from a cooperating aircraft if it has bearing transmission capability. If the cooperating aircraft is not equipped with bearing transmission equipment, only distance information is received and the HSI No. 1 bearing pointer will rotate clockwise at 30 degrees per second.

Volume Control Knob

The volume control knob is used to turn the tacan on and off and for volume adjustment of the station identity tone signal.

Channel Selector Knob

The channel selector knob provides for selection of 126 tacan channels. The control consists of an outer knob used to select the units digit of the channel counter (0 to 9), and an inner knob used to select the tens and hundreds digits (00 to 12).

XY Switch

The XY switch is a toggle-type switch with positions of X and Y. Placing the switch to the X position provides capability for 126 channel operation. Placing the switch to the Y position adds an additional 126 channel capability to the tacan system.

Steering Mode Knob

With the steering mode knob on the steering mode panel set to the TCN (tacan) position, the tacan supplies information to the HSI, ADI and HUD (figure 1-14). The HSI displays the course of the selected tacan radial, deviation from the selected radial, and to-from indication. In addition, the tacan supplies information to the HSI number 1 bearing pointer and to the range indicator to indicate distance and magnetic bearing to the tacan station. A steering signal which aids the pilot in making an asymptotic approach to the selected tacan radial is displayed on the bank steering bar of the ADI and the HUD.

Course Set Knob

The course set knob is used for manually selecting the desired tacan magnetic course.

Heading Set Control

The heading set control is used for adjusting the magnetic command heading marker.

INSTRUMENT LANDING SYSTEM (ILS)

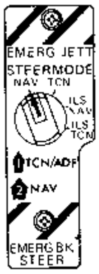
The instrument landing system provides the capability for the aircraft to make a precision landing approach and descent. The localizer function provides lateral guidance information to position the aircraft on the runway center line during approach. The localizer frequency range is 108.10 to 111.95MHz. The localizer identification tone can be heard in the headset during ILS operation. A course deviation warning flag appears on the HSI if the localizer signal is unreliable. The glideslope function provides vertical guidance information to position the aircraft on the glideslope angle during the final approach. A glideslope warning flag appears on the ADI if the glideslope signal is unreliable. Glideslope steering symbols are displayed on the HUD. When the ILS/NAV or ILS/TCN position is selected on the steering mode panel, ILS-N or ILS-T appears on the HUD. At the same time CSET appears on the HUD to remind the pilot to set the final approach course. The CSET symbol flashes for 10 seconds and then disappears. When the aircraft reaches a point within approximately 0.6° of the glideslope center, a GSUP or GSDN (glideslope up or glideslope down) symbol appears on the HUD, the ADI glideslope warning flag drops from view, and the ADI glideslope indicator appears on the top dot (for GSUP) which represents an approximate 0.6°. The glideslope symbol which appears on the HUD depends on whether the aircraft is above or below the glideslope center. When the aircraft captures the glideslope center, the GSUP or GSDN symbol disappears, the pitch steering bar appears on the HUD to join with the bank steering bar, and the pitch steering bar appears on the ADI. A beacon light adjacent to the HSI begins flashing when the aircraft passes over a marker beacon. A MKR also flashes on the head-up display indicator. ILS guidance information is displayed on the HSI, ADI, and head-up display indicator (see figure 1-15).

ILS CONTROLS

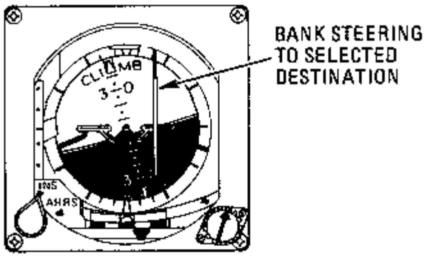
The controls for the ILS are on the ILS/tacan control panel on the left console. The controls consist of frequency selector knobs to select the frequency for the ILS operation. The inner knob selects the units and tens counters (08 to 11 in increments of 1), and the outer knob selects the decimal counter. The hundreds digit is fixed. The volume control knob controls the audio of the localizer signal, and when the knob is turned fully counterclockwise it turns off the ILS system.

TACAN/NAV MODE DISPLAYS

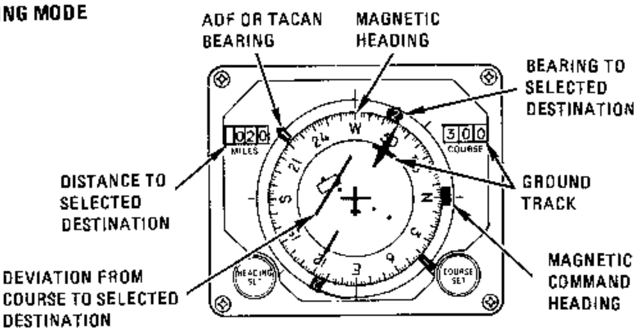
NAV



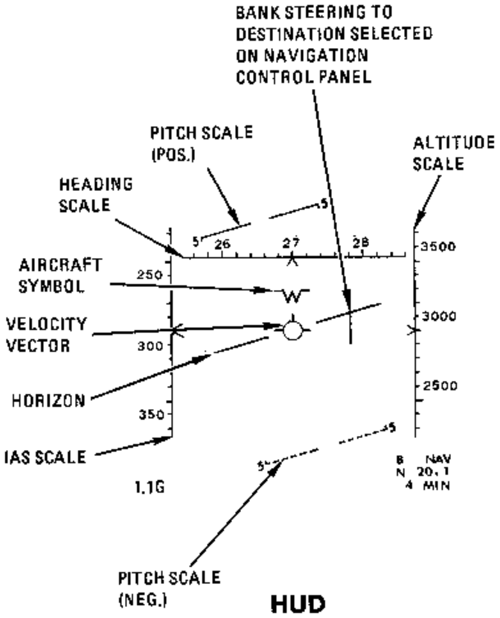
STEERING MODE PANEL



ADI

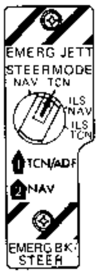


HSI

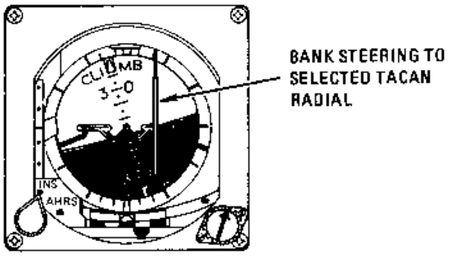


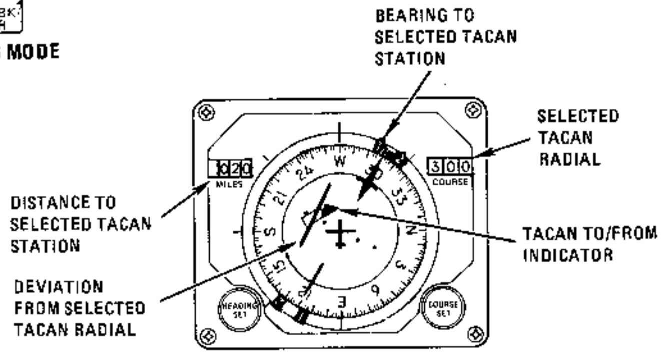
HUD
(ADI Mode
NAV– Base Selected –
Gear Up)

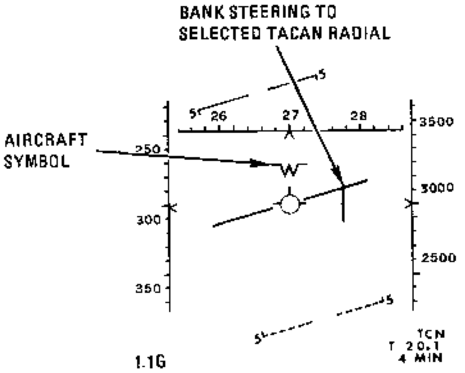
TACAN



STEERING MODE PANEL




BEARING TO SELECTED TACAN STATION
SELECTED TACAN RADIAL
020
MILES
300
COURSE
DISTANCE TO SELECTED TACAN STATION
TACAN TO/FROM INDICATOR
DEVIATION FROM SELECTED TACAN RADIAL
HEADING SET
COURSE SET



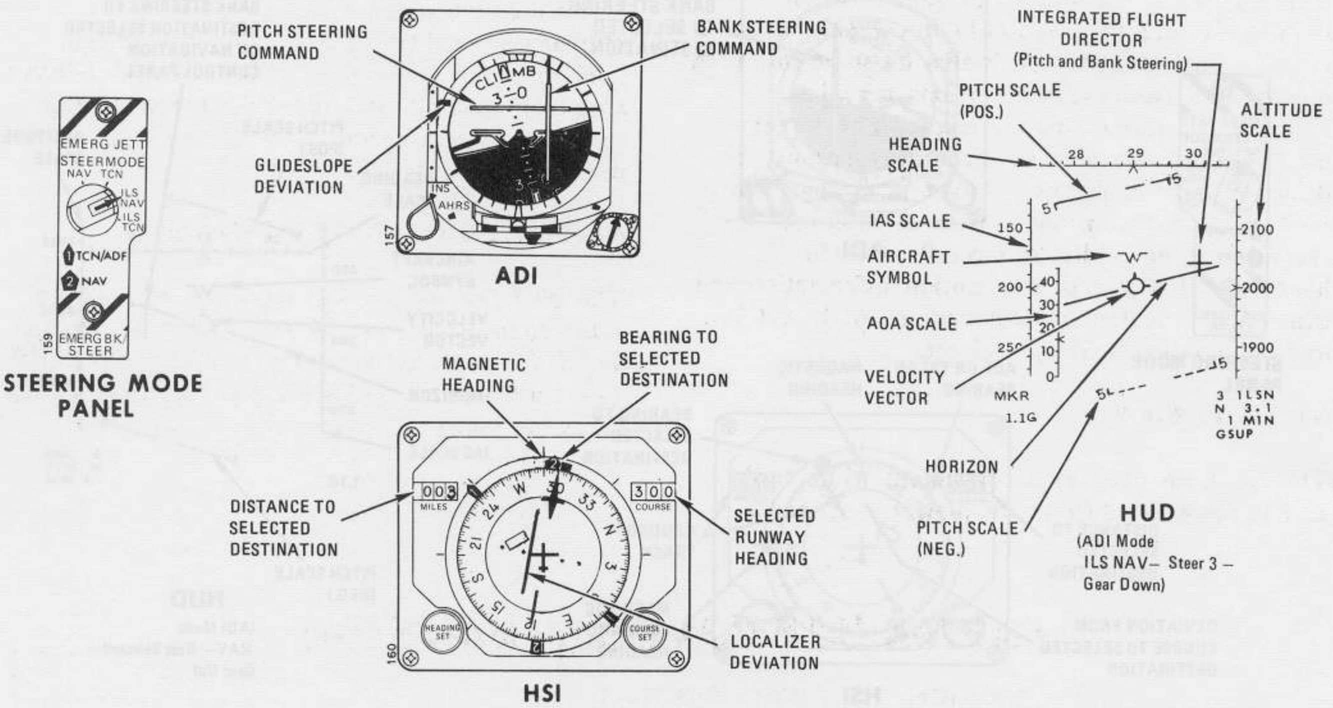
HUD
(ADI Mode
TCN–
Gear Up)

15A–1–(24)J

Figure 1-14

ILS/NAV AND ILS/TACAN MODE DISPLAYS

ILS/NAV



ILS/TACAN

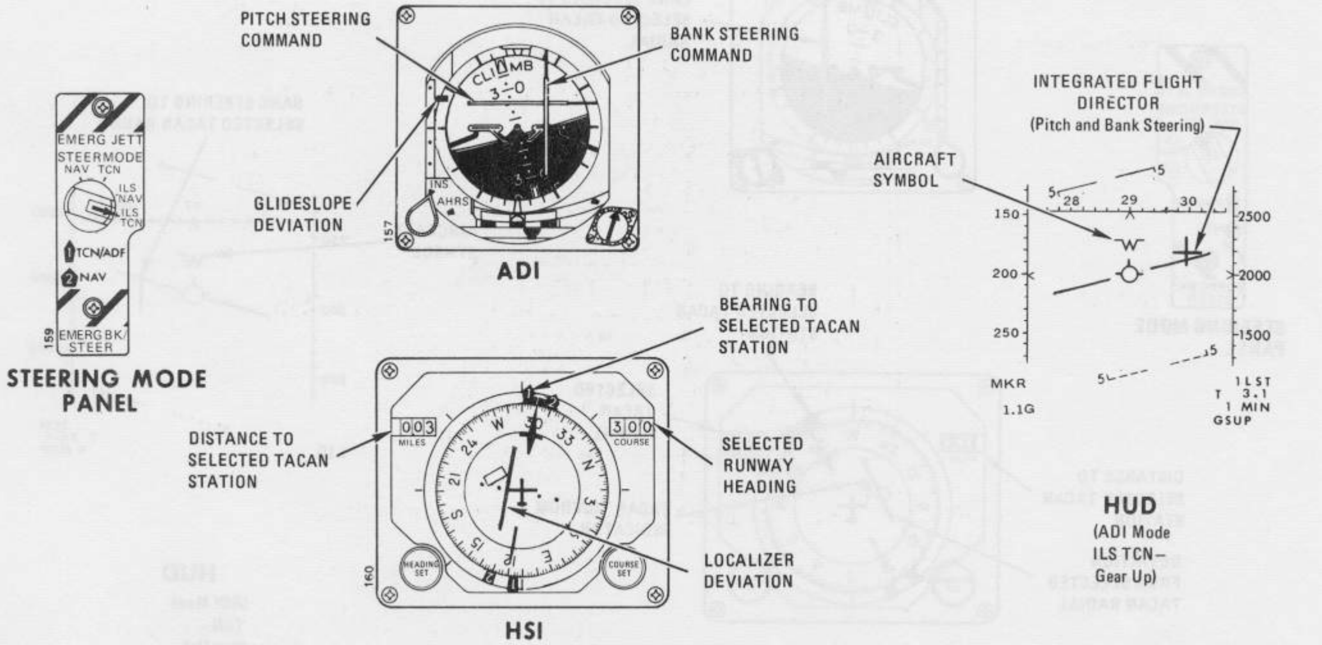


Figure 1-15

INERTIAL NAVIGATION SYSTEM

The inertial navigation system (INS) is a self-contained, fully automatic navigation system which provides continuous present position monitoring and the capability for visual, tacan or radar updating. Data for twelve destinations, with offsets, and twelve tacan stations may be inserted for mission requirements. The target mark feature provides an airborne capability to designate and store three target positions. The INS supplies the primary attitude reference for the aircraft. In addition, aircraft attitude, heading, velocity and acceleration information are utilized by the fire control system, ADI, AHRS, and automatic flight control set.

Inertial Platform

The platform maintains continuous pitch, roll and relative azimuth at all platform attitudes. The gimbals provide 360° freedom of rotation, allowing the platform to remain level with respect to local gravity.

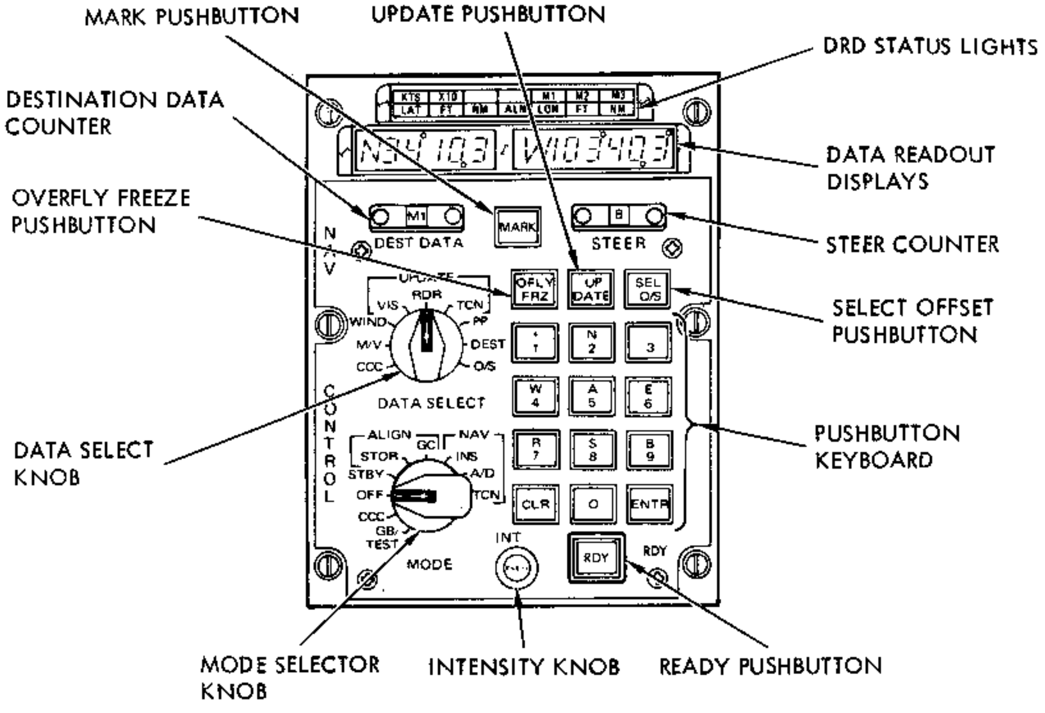
Digital Computer

The computer controls the INS alignment sequence, computes aircraft present position, horizontal and vertical velocities, inertial altitude, and true heading, and processes accelerometer signals. It also provides BIT control and performs BIT functions.

NAVIGATION CONTROL INDICATOR

The NCI, located on the right console, (figure 1-16) contains its own power supply. It contains all of the controls necessary to operate the INS. The controls and indicators are described in the following paragraphs.

NAVIGATION CONTROL INDICATOR



15A–1–(101)

Figure 1-16

Mode Selector Knob

The mode selector knob is used to align the INS and select navigation mode.

INS	This is the primary navigation mode. In this mode, the INS solves the navigation problem by sensing aircraft accelerations, applying appropriate corrections and determining aircraft velocity and position. Steering to destination is computed in the CC based on inertially derived present position.
A/D	The air data mode is a backup to the primary INS mode. If the INS fails, the CC automatically switches to the air data navigation mode. The central computer utilizes true airspeed, wind velocities, and magnetic heading to derive aircraft position and compute steering to destinations. INS computation of inertially derived aircraft velocity and position is not disturbed by selection of A/D mode.
TCN	The CC utilizes pre-stored tacan station latitude and longitude, magnetic variation, and tacan measured range and bearing to derive aircraft present position, and compute steering to destination. INS computation of inertially derived aircraft velocity and position is not disturbed by selection of this mode.
CCC	Applies power to the NCI for the programming and readout of CC data.
STBY	This mode is used only to preheat the INS to avoid alignment time delays in extremely cold temperatures. Normally this mode is bypassed and the mode selector knob is placed directly from OFF to one of the alignment modes. The mode is also used for NCI and CC operation.
STOR	The stored heading position allows the use of GC alignment parameters which have been previously stored at time of power shut-off so that rapid alignment of the INS can occur. This mode is used only when aircraft has not been moved after power has been turned off. Time of alignment in this mode is approximately 3 minutes but may be longer in cold temperatures. When alignment is completed, the ALN (align) light on the NCI display window will flash.
GC	Gyrocompass alignment enables the INS to achieve a high alignment accuracy. Approximately 3 minutes after placing the mode selector knob to GC the INS is coarse aligned to best available true heading (BATH). At this time, the ALN (align) light comes on steady. After approximately 9 minutes, the INS will be fully aligned and the ALN light begins flashing.
GB/TEST	Initiates a gyro bias test. This is a ground test function.
OFF	Power is removed from the INS.

Data Select Knob

The rotary data select knob selects the type of program data which is to be programmed and displayed on the data readout displays.

CCC	Allows the programming and readout of CC data. Entry of tacan channel, latitude, longitude, magnetic variation and altitude is performed in this position.
M/V	Selects magnetic variation for entry and display.
WIND	Selects wind data for entry and display from the CC.
VIS	Allows a visual overfly present position update when a valid CC signal is present. If the CC signal is invalid, then allows an INS visual overfly update if the INS position is selected with the mode selector knob.
RDR	Allows a radar present position update through the CC.

TCN	Allows a present position update through the CC when a stored tacan station is locked on in transmit/receive mode.
PP	Selects present position latitude and longitude for entry and display.
DEST	Allows the entry and display from the CC of latitude, longitude, and altitude for any of the 12 destinations or three mark positions selected on the destination data counter.
O/S	Allows the entry and display from the CC of offset distances in feet north-south and east-west, or offset range in miles and tenths and bearing with respect to the destination selected on the destination data counter, or the corresponding altitude of the offset point.

Destination Data Counter

Selects any of 12 destination (B, 1-11) or 3 marks (M1, M2, M3) for data entry and display when the DEST position on the data select knob is selected. Depressing the pushbutton on the right side advances the counter one digit on the destination data counter. The counter has 16 positions, the sixteenth occurring after M3 in the sequence. However, the sixteenth position is unlabeled and is normally nonfunctional. Depressing the left pushbutton decreases the counter one digit.

Steer Counter

Selects any one of 12 destination or 3 mark positions (M1, M2, M3) to which steering information is presented on the cockpit indicators. The steer pushbuttons on each side of the steer counter operate the same as the destination pushbuttons.

Pushbutton Keyboard

The pushbutton keyboard consists of 10 alphanumeric pushbutton keys and CLR (clear) and ENTR (enter) pushbuttons. The alphanumeric keys are used to type both numbers and letters including plus and minus symbols into the NCI. Data is inserted in the NCI displays by selecting the type of data to be entered using the data select knob, enabling the keyboard by depressing the RDY pushbutton, and then depressing the appropriate alpha key followed by the numeric keys. To enter the data from the NCI into the CC/INS, the ENTR pushbutton is depressed. Depressing the CLR pushbutton (prior to depressing ENTR) removes incorrectly typed data from the NCI displays.

Overfly Freeze Pushbutton

Depressing the overfly freeze (OFLY FRZ) pushbutton freezes the latitude and longitude error display on the data readout displays when performing a visual position update. The VIS position on the data select knob enables the OFLY FRZ button.

Update Pushbutton

Depressing the UPDATE pushbutton manually accepts a navigation position update, when the data select knob is in the VIS, RDR or TCN position. The update pushbutton is also used to sequence the insertion of tacan station information and mission data.

Select Offset Pushbutton

Depressing the select offset (SEL O/S) pushbutton inserts stored offset data for the destination selected on the steer counter into the navigation problems.

Mark Pushbutton

Depressing the MARK pushbutton stores either the computed latitude and longitude of a designated air-to-ground target or aircraft present position latitude and longitude (overfly) if no target is designated. The appropriate M1, M2, and M3 light above the right data readout display illuminates to indicate the mark position into which latitude and longitude was stored when the mark pushbutton was last depressed. Each time the MARK pushbutton is depressed, the current MARK light will go out. If the pushbutton is depressed again after M3 is inserted, the M3 light goes out, the M1 light comes on, the data stored for the first mark depression (M1) is erased, and new position data is stored in the M1 position.

Data Readout Displays

The data readout displays (DRD), or monitor windows, display the data being entered, or the data selected for display. The DRDs display all alphanumeric inputs available in the keyboard, including minus signs. Plus signs are not displayed. The DRD status lights, above the DRD, illuminate to indicate the units of the data being displayed, such as knots (KTS) when wind is displayed, or nautical miles (NM) when offset range is displayed.

Ready Pushbutton

Depressing the ready (RDY) pushbutton illuminates the pushbutton and also illuminates and enables the pushbutton keyboard. At the same time the CLR (clear) and ENTR (enter) pushbuttons are enabled. Alternate depression of the RDY pushbutton causes the pushbutton to illuminate or extinguish.

Intensity Knob

The intensity knob adjusts the brightness of the DRD, and DRD status lights, and the ready pushbutton. Depressing the intensity knob (press to test) illuminates all the NCI lights. The leftmost digit of the right DRD illuminates as a minus (−) and a 1, all other DRD digits illuminate as eights (8).

CENTRAL COMPUTER

The central computer (CC) is a high speed, stored program, general purpose digital computer that performs mission oriented computation from data received from control panel and subsystems aboard the aircraft. The computations include A/A and A/G steering and weapon delivery, navigation, flight director, and control and display management. The CC provides the pilot with steering and weapon delivery cues, target data, avionic system status, weapons configuration and flight data in the air-to-air attack, air-to-ground attack, visual identification (VI), and attitude director indicator (ADI) modes of operation. The CC computations are controlled by the operational flight program stored in the CC memory. Failure detection of the peripheral systems and CC internal operation is done by continual monitoring. Back up system substitution is also accomplished in the central computer. If the computer detects a power loss or failure, the CC light on the BIT panel, and AV BIT light on the caution light panel will come on steady.

CENTRAL COMPUTER INTERFACE

The central computer is interfaced with the radar, armament control system (ACS), air data computer (ADC), attitude heading reference system (AHRS), horizontal situation indicator (HSI), head up display (HUD), lead computing gyroscope (LCG), signal data recorder (SDR), radar warning receiver (RWR), inertial navigation measuring unit (IMU), vertical situation display (VSD), navigation control indicator (NCI), the BIT panel and the avionics status panel. A CC reset is performed by depressing the CC reset button on the BIT panel. The CC reset should be initiated only if a CC problem is suspected.

AIR DATA COMPUTER

The air data computer (ADC) is a digital computer which receives inputs from the pitot-static system, the AOA probes, the left total temperature probe, the altimeter setting knob, the nose landing gear door switch, and the flap switch. The ADC corrects these inputs for sensor error as required, computes various parameters from this data and furnishes required parameters to aircraft equipment and cockpit displays (refer to figure 1-17). The ADC performs validity checks on critical data received by the using equipment or display and actuates appropriate caution lights or warning flags if the data is invalid. Operation of the ADC is entirely automatic and no controls are available to the pilot.

AIR DATA COMPUTER

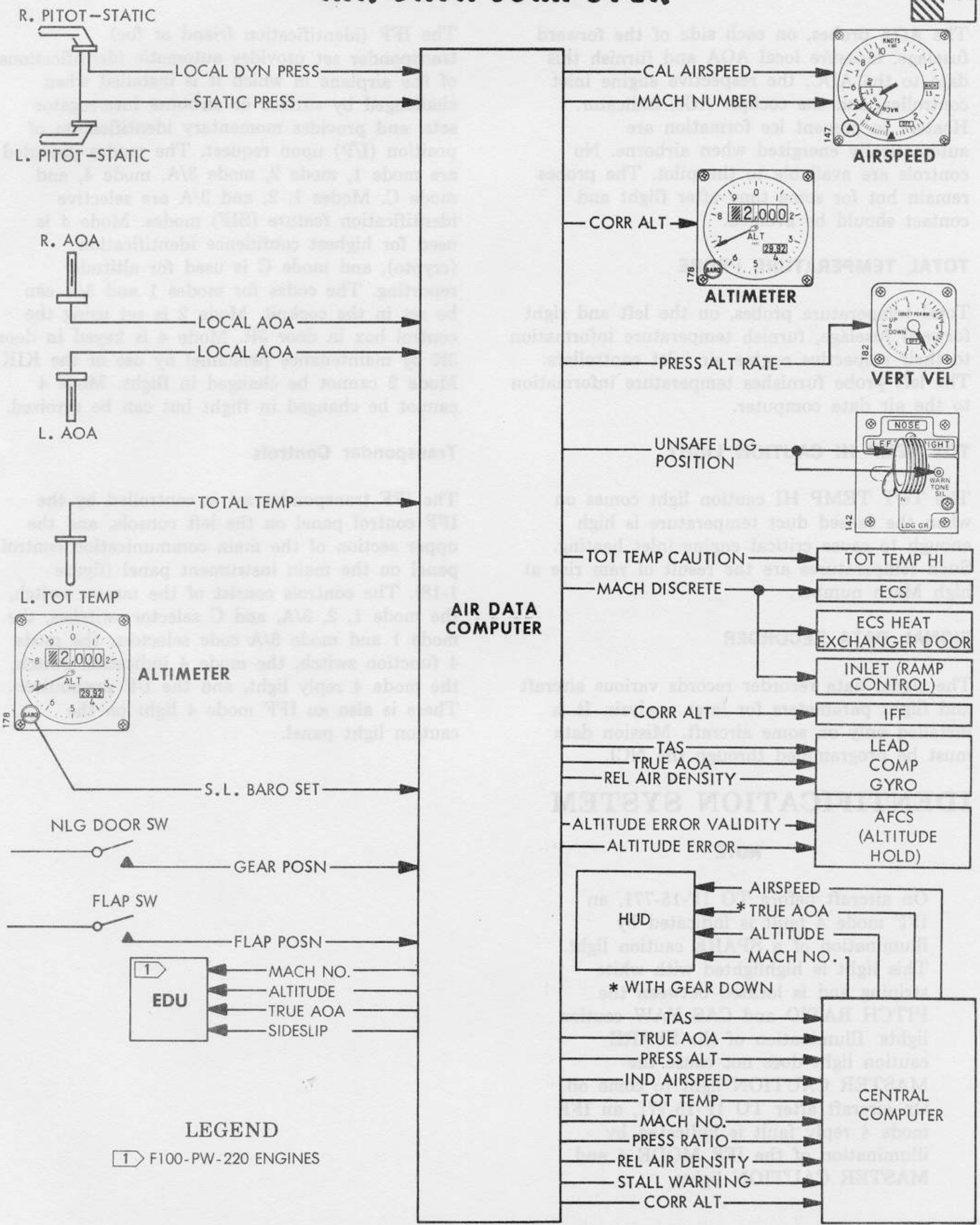


Figure 1-17

ANGLE-OF-ATTACK (AOA) PROBES

The AOA probes, on each side of the forward fuselage, measure local AOA and furnish this data to the ADC, the respective engine inlet controller, and the cockpit AOA indicator. Heaters to prevent ice formation are automatically energized when airborne. No controls are available to the pilot. The probes remain hot for some time after flight and contact should be avoided.

TOTAL TEMPERATURE PROBE

Total temperature probes, on the left and right forward fuselage, furnish temperature information to their respective engine air inlet controllers. The left probe furnishes temperature information to the air data computer.

TOT TEMP HI CAUTION LIGHT

The TOT TEMP HI caution light comes on when the sensed duct temperature is high enough to cause critical engine inlet heating. Such temperatures are the result of ram rise at high Mach number.

SIGNAL DATA RECORDER

The signal data recorder records various aircraft and flight parameters for later analysis. It is installed only on some aircraft. Mission data must be programmed through the NCI.

IDENTIFICATION SYSTEM

NOTE

> On aircraft before TO 1F-15-771, an IFF mode 4 fault is indicated by illumination of a SPARE caution light. This light is highlighted with white striping and is located between the PITCH RATIO and CAS YAW caution lights. Illumination of the SPARE caution light does not cause the MASTER CAUTION light to come on. On aircraft after TO 1F-15-771, an IFF mode 4 reply fault is indicated by illumination of the IFF MODE 4 and MASTER CAUTION lights.

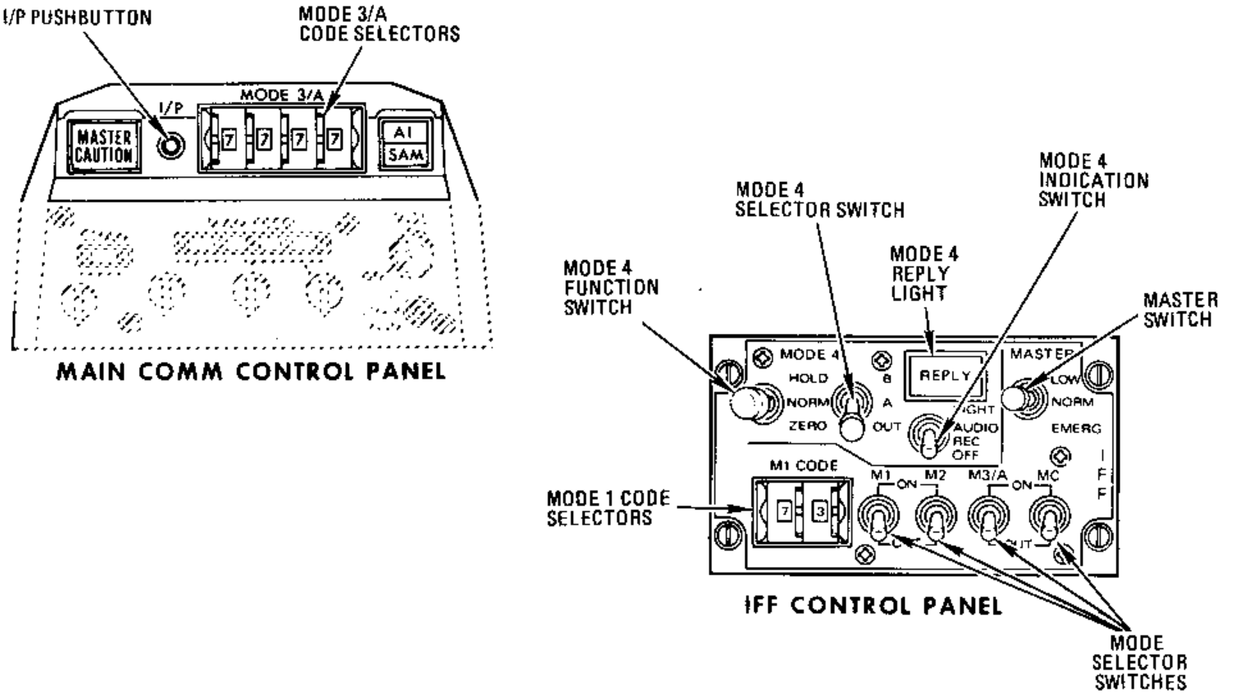
IFF TRANSPONDER SET

The IFF (identification friend or foe) transponder set provides automatic identifications of the airplane in which it is installed when challenged by surface or airborne interrogator sets, and provides momentary identification of position (I/P) upon request. The modes provided are mode 1, mode 2, mode 3/A, mode 4, and mode C. Modes 1, 2, and 3/A are selective identification feature (SIF) modes. Mode 4 is used for highest confidence identification (crypto), and mode C is used for altitude reporting. The codes for modes 1 and 3/A can be set in the cockpit. Mode 2 is set using the control box in door 3R. Mode 4 is keyed in door 3R by maintenance personnel by use of the KIK. Mode 2 cannot be changed in flight. Mode 4 cannot be changed in flight but can be zeroized.

Transponder Controls

The IFF transponder set is controlled by the IFF control panel on the left console, and the upper section of the main communication control panel on the main instrument panel (figure 1-18). The controls consist of the master switch, the mode 1, 2, 3/A, and C selector switches, the mode 1 and mode 3/A code selectors, the mode 4 function switch, the mode 4 indication switch, the mode 4 reply light, and the I/P pushbutton. There is also an IFF mode 4 light on the caution light panel.

IFF CONTROL PANELS



MAIN COMM CONTROL PANEL

IFF CONTROL PANEL

15A-1-(123)A

Figure 1-18

MASTER SWITCH

LOW	System operates with reduced sensitivity. Mode reception is reduced; however, mode 4 response to a valid interrogation is normal.
NORM	System operates at full sensitivity.
EMERG	Selects normal sensitivity emergency IFF operation. Allows the system to respond to interrogations in modes 1, 2, 3/A, C and 4. The reply for modes 1 and 2 is the code selected on the applicable dials, while mode 3/A transmits code 7700.

MODE 1, 2, 3/A, AND C SELECTOR SWITCHES

Two-position selector switches control the operation of these modes as follows:

ON	Enables response to mode interrogation.
OUT	Disables mode response.

MODE 4 SELECTOR SWITCH

The three-position mode 4 selector switch controls operation of mode 4 as follows:

B	Enables mode 4/B reply.
A	Enables mode 4/A reply.
OUT	Disables all mode 4 replies; however, the IFF MODE 4/SPARE caution light function remains in operation.

MODE 1 CODE SELECTOR

00 to 73	Used to select mode 1 reply code.

MODE 3/A CODE SELECTOR

0000 TO 7777	Used to select mode 3/A reply code.

MODE 4 FUNCTION SWITCH

HOLD	Momentarily positioning the switch to HOLD after landing and waiting 15 seconds before turning off aircraft electrical power retains the code after aircraft power is turned off. Has no function in flight.
NORM	Permits operation as selected by the mode 4 selector switch.
ZERO	Sets the code settings back to zero.

MODE 4 INDICATION SWITCH

LIGHT	When the mode 4 system replies to valid interrogation being transmitted above a minimum threshold rate, the REPLY light will illuminate.
AUDIO REC	Enables mode 4 audio receive operation even if M1, M2, M3/A, MC and the M4 selector switches are set to OUT. Allows audio tone when valid interrogations are received. In this position the light operation works as described in LIGHT.
OFF	Disables the mode 4 AUDIO REC and LIGHT functions. Does not affect IFF MODE 4/SPARE caution light operation.

IFF MODE 4/SPARE CAUTION LIGHT

Illumination of the IFF MODE 4/SPARE caution light can be caused by failure to respond to a valid interrogation, zeroized code, or internal component failure. On aircraft before TO 1F-15-771, a SPARE caution light is used in place of the IFF MODE 4 light. On these aircraft, the IFF MODE 4 light will not illuminate and the MASTER CAUTION light will not illuminate with the SPARE light for a mode 4 reply fault. After TO 1F-15-771, an IFF mode 4 reply fault is indicated by illumination of the IFF mode 4 and MASTER CAUTION lights. If the mode 4 system is not keyed or is zeroized by the pilot, the IFF MODE 4/SPARE light will be on steady.

NOTE

> The logic in the Mode 4 system is such that while the reply LIGHT is on (plus a small time delay after it goes out), the operation of the IFF MODE 4/SPARE caution light is inhibited. Therefore, in a high density interrogation environment, it may be desirable to place the MODE 4 INDICATION SWITCH to LIGHT or AUDIO REC to minimize the effects of spurious signals or system overloads mixed in with valid responses.

IDENTIFICATION OF POSITION (IP) PUSHBUTTON

I/P	Pressing the pushbutton enables the IFF system to transmit momentary identification of position when interrogated. The response is continued for a period of 15 to 30 second duration after the pushbutton is released.

IFF ANTENNA SELECTOR SWITCH

The antenna selector switch is on the left console adjacent to the IFF control panel.

UPPER	Selects upper antenna
LOWER	Selects lower antenna
BOTH	Provides automatic antenna selection

IFF EMERGENCY OPERATION

Upon ejection from the cockpit, the IFF emergency mode automatically becomes active if mode 1, 2, 3/A, or C is enabled.

IFF INTERROGATOR SET

The interrogator control panel contains the controls for providing air-to-air (AAI) target identification. Refer to Nonnuclear Weapons Delivery Manual, TO 1F-15A-34-1-1 or TO 1F-15C-34-1-1 for description of the system.

TACTICAL ELECTRONIC WARFARE SYSTEM (TEWS)

Refer to Nonnuclear Weapon Delivery Manual, TO 1F-15A-34-1-1-1 for description of the Tactical Electronic Warfare System (TEWS).

RADAR SYSTEM

Refer to Nonnuclear Weapons Delivery Manual, TO 1F-15A-34-1-1 or TO 1F-15C-34-1-1 for description and operation of the Radar System.

WEAPON SYSTEMS

Refer to the Nonnuclear Weapons Delivery Manual, TO 1F-15A-34-1-1 for a detailed and operational description of the following systems.

Aircraft Weapons Capabilities
Armament Control Set
Head-Up Display System
Vertical Situation Display System
AAI System
Stores Jettison System
Weapon Employment
Suspension Equipment
Bomb Fuzes
Combat Weapons
Training Weapons
Camera Systems
KY-28 Speech Security Unit

FIGHTER TRAINER (F-15B/D)

The aircraft is a tandem configured aircraft which performs the secondary role of a trainer without compromising its primary role of an all-weather air superiority fighter. The rear cockpit, and the differences between the front cockpit and canopy system relative to the single seat version, are discussed below.

CANOPY SYSTEM

The canopy system is the same as the single-seat system except: a hand pump is added in the nose wheelwell; the external canopy unlock fitting and the internal canopy manual unlock handle are removed; the operation of external and internal canopy control handles are slightly different; and different operation of the canopy with hydraulic pressure off the aircraft and accumulator hydraulic pressure depleted. The canopy can be operated without accumulator pressure by moving the external canopy control handle or one of the internal canopy handles to the UP or DN position, as desired, and then operating the hand pump in the nose wheelwell. For ground egress with accumulator hydraulic pressure depleted, the canopy can be opened by placing the internal canopy control handle to UP and then pushing up on the canopy. A nitrogen charge in the canopy actuator aids in opening the canopy manually. The operation of the internal and external canopy control handles are changed so that the canopy is locked mechanically by placing the handle to LOCKED from the DN position, once the canopy is fully closed. This mechanical locking feature eliminates the need for the internal canopy manual unlock handle and the external canopy unlock fitting, as the normal handles can be used to unlock the canopy internally or externally in the absence of hydraulic pressure.

EXTERNAL CANOPY CONTROL HANDLE

The external canopy control handle operates the same as on the single-seat version except that it mechanically locks the canopy by placing the handle to the LOCK position from the DOWN position, once the canopy is against the windscreen. The LOCKED, UP, DN and HOLD positions duplicate the functions of the corresponding positions for the internal canopy control handle. On aircraft 76-0132 and up, the force required to operate the handle is reduced.

FRONT COCKPIT

The front cockpit is identical to the single-seat cockpit except that an intercom system has been added, the oxygen quantity gage registers 10 liters, and the speed brake switch can be overridden by the rear cockpit speed brake switch. In addition, the internal canopy unlock handle is removed, and the internal canopy control handle operates somewhat differently.

Internal Canopy Control Handle

The canopy control handle has four positions: LOCKED, DN, HOLD and UP. The front and rear handles are interconnected and follow each other in position when one handle is moved. The canopy control handle operates the same as in the single-seat aircraft except that the locking mechanism is mechanical rather than hydraulic. On aircraft 76-0132 and up, the force required to operate the handle is reduced.

LOCKED	Causes a hydraulic block, therefore it is necessary to have the canopy against the windscreen before placing the handle in LOCKED. Placing the handle to the LOCKED position mechanically locks the canopy.
UP	Raises canopy to maximum open position. If selected from the LOCKED position, the canopy will first unlock, then move 1.5 inches aft before rising.
DN	Lowers canopy full down, then forward against the windscreen.
HOLD	Creates a hydraulic lock and stops the canopy at any point in the open or close cycle. This position may be used when the canopy is to be left open for and extended period.

Oxygen Quantity Gage

The appearance of a power-off flag on the gage face is an indication of a loss of electrical power.

REAR COCKPIT

The rear cockpit contains the equipment described in the following paragraphs. Refer to foldout section for rear cockpit illustration.

STICK GRIP

The only operative control is the trim button.

Oxygen Low Caution Light

The OXY LOW light will come on when oxygen quantity is below 4 liters. The light will also come on with the oxygen quantity test button depressed when the oxygen quantity gage pointer drops below 4 liters.

Fire Warning Lights

The left and right fire/overheat warning lights are advisory only and provide no capability for fuel and bleed air shutoff or fire extinguishing action. The rear cockpit lights operate in conjunction with the forward cockpit lights when the fire extinguisher switch is placed to TEST.

Vertical Situation Display (VSD)

The rear cockpit VSD provides the same displays as the front cockpit VSD for all radar modes including the IFF confidence symbols, the video for TV weapons, and aircraft flight status symbology.

Master Caution Light

A rear cockpit master caution light illuminates any time the front cockpit master caution light illuminates. The light can not be extinguished from the rear cockpit.

AI/SAM Warning Lights

Refer to TO 1F-15A-34-1-1-1

Main Communication Control Panel

The rear cockpit main communication control panel operates and functions the same as the main communication control panel in the front cockpit, except the mode 3/A thumbwheels and the I/P pushbutton are inoperative.

Internal Canopy Control Handle

The internal canopy control handle functions the same as the internal canopy control handle in the front cockpit.

Canopy Jettison Handle

The canopy jettison handle functions the same as the canopy jettison handle in the front cockpit.

Canopy Actuated Initiator Firing Indicator

There is no canopy actuated initiator firing indicator in the rear cockpit.

Canopy Unlock Warning Light

The rear cockpit light operates identically as the front cockpit canopy unlock light.

Caution Lights Panel

The caution lights panel contains a SPD BK OUT light, TOT TEMP HI light, FUEL LOW light, BINGO FUEL light, and an OXY LOW light. These lights illuminate any time the respective front cockpit caution light illuminates.

Airspeed Mach Indicator

The airspeed/mach indicator receives the same signals sent to the front cockpit airspeed/mach indicator.

Angle Of Attack (AOA) Indicator

A measurement of local AOA sensed by a left and right probe supplies signals to both the front and the rear angle of attack indicators.

Accelerometer

The accelerometer measures acceleration g loads. It operates the same but is independent of the front cockpit accelerometer.

Landing Gear Indicator

LEFT, RIGHT and NOSE gear indicators are provided to show landing gear position. Signals sent to the front cockpit indicators are also sent to the rear cockpit indicators. The UNSAFE light will come on anytime the landing gear handle warning light in the front cockpit comes on indicating the same conditions exist.

Emergency Brake/Steering Control

The front and rear cockpit emergency brake/steering control performs the same function.

Speed Brake Switch

The rear cockpit speed brake switch will override any position selected by the front cockpit. It is spring-loaded to the hold (centered) position. When the rear cockpit switch is released to hold, control is returned to the front cockpit.

Attitude Director Indicator

The same input signals which are sent to front cockpit attitude director indicator are also sent to the rear cockpit.

Horizontal Situation Indicator

The horizontal situation indicator receives the same signals sent to the front cockpit horizontal situation indicator.

Master Mode Controls Marker Beacon Panel

The A/G, ADI, and VI mode advisory lights in the rear cockpit indicate what mode the pilot in the front cockpit has selected. The beacon light receives the same signals sent to the front cockpit beacon light.

Rudder Pedals and Rudder Pedal Adjust Knob

The same functions are performed by the front and the rear rudder pedals and rudder pedal adjustment knob.

Altimeter

The altimeter receives the same signals as the front cockpit altimeter.

Vertical Velocity Indicator

Inputs supplied to the rear cockpit vertical velocity indicator are the same as those sent to the front cockpit vertical velocity indicator.

Tachometers

Left and right tachometers receive the same signals as the front cockpit tachometers.

Fan Turbine Inlet Temperature Indicators

Temperatures measured at the fan inlet are supplied to both the front and rear fan turbine inlet temperature indicators.

Utility Light

A utility light above the right console operates the same as the utility light in the front cockpit, except that it is powered by the left 28 volt dc bus and therefore does not operate off the JFS generator.

Dual Seat Operation

A command selector valve is provided in the rear cockpit to select the desired ejection sequence to be initiated from the rear cockpit, or provide for single ejection for solo flight. Positioning is accomplished by pulling full aft then turning to the desired position. To release from aft initiate, pull then turn clockwise. Solo position requires use of a collar.

NORM (vertical)	Single rear seat ejection when initiated from the rear cockpit. Dual ejection (rear seat first) when initiated from the front cockpit.
AFT INITIATION (horizontal)	Dual ejection (rear seat first) when initiated from either seat.
SOLO (45° CCW)	Single ejection from front cockpit only. Ejection from the front seat is immediate. Ejection from the rear seat is impossible.

Intercom System

Intercommunications are provided between the crewmembers, as well as between either crewmember and the ground crew. Rear cockpit intercom operates whenever the front cockpit intercom operates.

TAKE COMMAND/ICS CONTROL PANEL

The take command/ICS control panel (one in each cockpit), contains the command controls and ICS controls. The intercom system is controlled only by the ICS portion of the control panel. However, all the panel controls are described in the following paragraphs. The panels contain a UHF comm command switch/indicator, a tacan/ILS nav command switch/indicator, and a ICS function selector switch.

UHF COMM COMMAND SWITCH/INDICATOR

Depressing the comm command switch/indicator in either cockpit takes or relinquishes command of the UHF communications system from one cockpit to the other. The switch/indicator is illuminated in the cockpit that has control.

TACAN/ILS NAV COMMAND SWITCH/INDICATOR

Depressing the TCN/ILS switch/indicator in either cockpit takes or relinquishes command of the tacan and ILS systems from one cockpit to the other. The switch/indicator is illuminated in the cockpit that has control.

ICS FUNCTION SELECTOR SWITCH

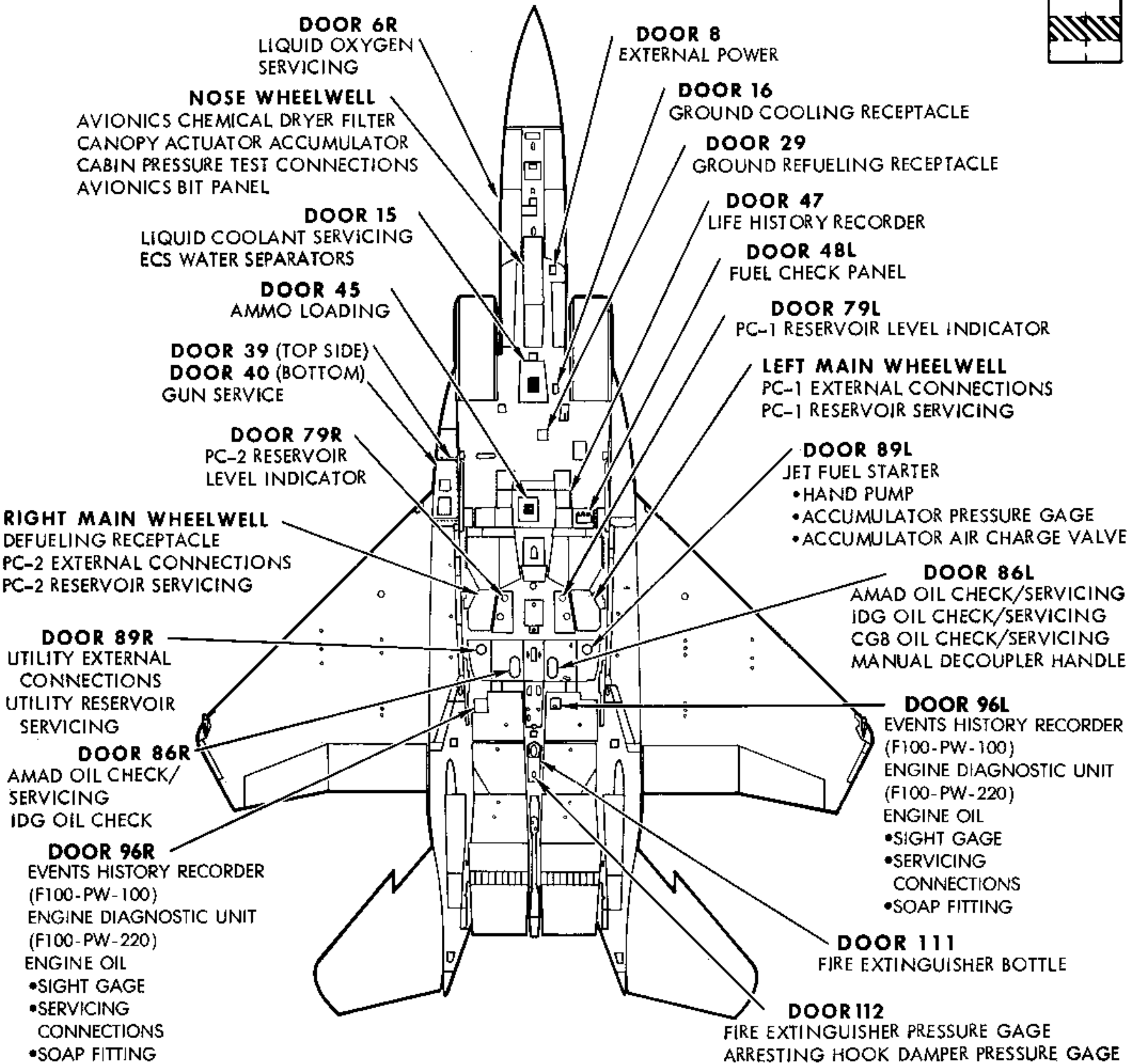
The ICS function selector switch on the take command/ICS control panel is a three-position toggle switch.

HOT MIC	Allows the microphone circuit in that cockpit to be activated.
COLD MIC	Disables the microphone circuit in that cockpit except for UHF transmissions.
RADIO OVERRIDE	Reduces the audio level of all signals (except intercom, unsafe gear, and TEWS launch) to facilitate inter-cockpit communications.

ICS VOLUME CONTROL KNOB

The ICS volume control knob on the integrated communications control panel in the rear cockpit adjusts the intercom audio volume level for the rear crewmember's headset.

SERVICING DIAGRAM



SPECIFICATIONS		USAF	NATO
FUEL	PRIMARY	MIL-T-5624, JP-4	F-40
	ALTERNATE (REFER TO SECTION V)	MIL-T-5624, JP-5 MIL-T-83133, JP-8	F-43 F-44 F-34 F-35
EXTERNAL ELECTRICAL POWER	115 ± 15 VAC, 400 ± 30 Hz	A/M 32A-60A ONLY	▨
HYDRAULIC FLUID	▨	MIL-H-5606 MIL-H-38282	H-515 H-537
OXYGEN	LIQUID	MIL-O-27210	▨

SPECIFICATIONS		USAF	NATO
OIL	TURBINE ENGINE CENTRAL GEAR BOX INTEGRATED DRIVE GENERATOR AMAD	MIL-L-7808 (NO ALTERNATE)	0-148
NITROGEN	GASEOUS	BB-N-411 GRADE A, TYPE I OR II	▨
OIL	M61A1 GUN	MIL-L-46000	▨
EXTINGUISHING AGENT	FIRE EXTINGUISHER BOTTLE	HALON-1301	▨

15A-1-(22)P

Figure 1-19

SECTION II

NORMAL PROCEDURES

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PREPARATION FOR FLIGHT

FLIGHT RESTRICTIONS

Refer to section V, Operating Limitations, for detailed aircraft and engine operating limitations.

FLIGHT PLANNING

Refer to Appendix A, Performance Data.

ABNORMAL PROCEDURES

Refer to section III for abnormal procedures.

TAKEOFF AND LANDING DATA CARD

If the takeoff distance exceeds one-half the available runway, the takeoff and landing data card in the Aircrew's Checklist should be completed.

WEIGHT AND BALANCE

For maximum gross weight limitations, refer to section V, Operating Limitations. For weight and balance information refer to the individual aircraft's DD Form 365-4 (FORM F), section V, Operating Limitations and the handbook of Weight and Balance Data, TO 1-1B-40.

PREFLIGHT CHECK

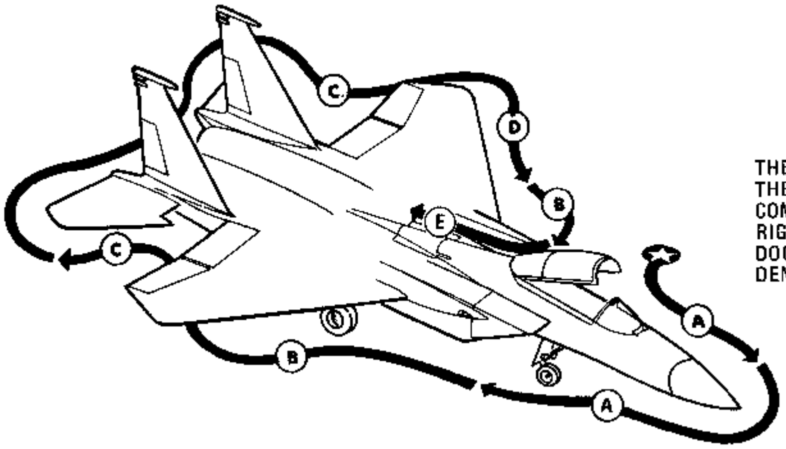
1. Check Form 781 for aircraft status and release.
2. Speedbrake chaff loading - AS REQUIRED.

EXTERIOR INSPECTION

1. Check general condition. Refer to figure 2-1.

   Check aircraft exterior for abnormalities which could affect flight (e.g., cracks or leaks). Check all sensors (AOA, pitot/static, inlet ice, total temperature). The ground intercom compartment door will be open. The hydraulic and JFS accumulator circular access panels (4) may be open for after start servicing. Check all other doors and panels closed and fastened. Check intakes clear of foreign objects. Check all external/internal inlet ramps in up position. Check tires for condition and inflation. Check gear struts for extension. Check landing gear pins (3), arresting hook pin, and canopy strut removed.

EXTERIOR INSPECTION



THE EXTERIOR INSPECTION STARTS AT THE COCKPIT STEPS THEN MOVES FORWARD AND AROUND THE AIRCRAFT. IT IS COMPLETED AT THE TOP OF THE FUSELAGE. THE LEFT AND RIGHT SIDES ARE THE SAME AND ARE LISTED ONCE. CHECK DOORS SECURE. BE ALERT FOR LOOSE FASTENERS, CRACKS, DENTS, LEAKS AND OTHER GENERAL DISCREPANCIES.

Ⓐ NOSE

1 UNDERSIDE

A. NLG TIRE, WHEEL AND STRUT CONDITION
B. NLG DOORS & LINKAGE SECURE, GROUND LOCK REMOVED
C. ANTENNAE CONDITION

2 FORWARD FUSELAGE

A. PITOT–STATIC PROBE CONDITION (2)
B. AOA PROBE SECURE CONDITION (2)
C. ENGINE INTAKE DUCT CLEAR (2)

Ⓑ CENTER FUSELAGE AND WING

1 WING

A. EXTERNAL STORES & PYLONS SECURE
B. NAVIGATION & FORMATIONS LIGHTS CONDITION
C. AILERON & FLAP CONDITION
D. FUEL DUMP/VENT MAST CONDITION

Ⓒ AFT FUSELAGE

1 GENERAL AREA

A. ARRESTING HOOK
B. STABILATOR CONDITION
C. RUDDER CONDITION
D. ANTENNA COVER CONDITION (VERTICAL STABILIZER)
E. NAVIGATION & FORMATION LIGHTS CONDITION
F. ENGINE EXHAUST AREA CONDITION

Ⓓ UNDERSIDE OF FUSELAGE

1 GENERAL AREA

A. ℄ STORE & PYLON SECURE

2 MAIN GEAR AND WHEELWELL

A. WHEEL, TIRE AND STRUT CONDITION
B. DOORS AND LINKAGE SECURE
C. GROUND LOCK REMOVED

Ⓔ TOP OF FUSELAGE

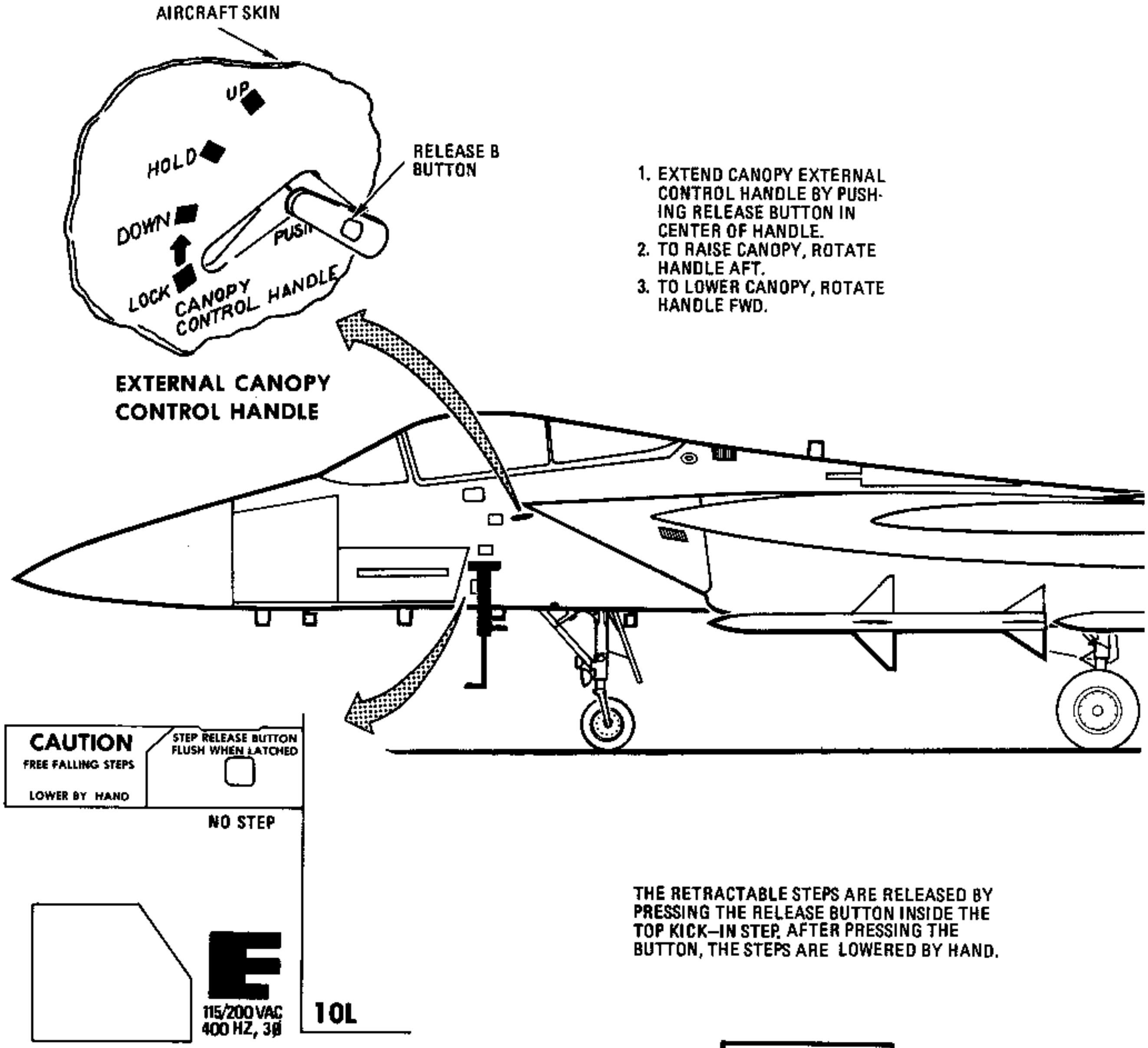
1 GENERAL AREA

A. SECONDARY HEAT EXCHANGER EXHAUST COVER REMOVED
B. EQUIPMENT BAY FIVE SECURE

15A–1–(17)G

Figure 2-1

COCKPIT ENTRY



1. EXTEND CANOPY EXTERNAL CONTROL HANDLE BY PUSHING RELEASE BUTTON IN CENTER OF HANDLE.
2. TO RAISE CANOPY, ROTATE HANDLE AFT.
3. TO LOWER CANOPY, ROTATE HANDLE FWD.

THE RETRACTABLE STEPS ARE RELEASED BY PRESSING THE RELEASE BUTTON INSIDE THE TOP KICK–IN STEP. AFTER PRESSING THE BUTTON, THE STEPS ARE LOWERED BY HAND.

WARNING

HAVE ALL PERSONNEL CLEAR AREA BENEATH THE LADDER BEFORE DEPRESSING BUTTON.

15A–1–(4)G

Figure 2-2

BEFORE ENTERING COCKPIT

Refer to foldout section for ejection seat illustration.

1. External electrical power - OFF
2. Canopy initiator indicator - NOT FIRED
   If indicator has been fired, the gray cap and orange spring will be exposed.
3. Ejection controls safety lever - LOCKED
4. Seat hose quick disconnect coupling - CHECK SECURE
5. Safety pins - REMOVED
   a. Canopy jettison handle pin
   b. Ejection seat safety pins (2)
   c. Canopy actuated initiator pin
6. Auto/manual seat kit deployment selector - AUTO
7. Radio beacon auto/manual selector - AS DESIRED
8. Restraint emergency release handle - FULLY DOWN
9. Battery window - NO RED SHOWING
10. (F-15A/C) Internal canopy manual unlocking handle - STOWED/PIN IN

For Solo Flight In F-15B/D Aircraft -

1. Command selector valve - SECURED IN SOLO POSITION
2. Rear cockpit - SECURED
   a. Ejection controls safety lever - LOCKED
   b. Solo flight tie down strap - INSTALLED
   c. Map case cover - SECURED
   d. Circuit breakers - IN
   e. Integrated communications control panel - SET
      (1) Main UHF and aux receiver/UHF 1 and 2 - ON AND SET
      (2) Antenna select - AUTO
      (3) Guard receiver - ON AND SET
      (4) ADF - OFF
      (5) Cipher switch - OFF
   f. Tacan/ILS - ON AND SET
   g. Arresting hook switch - UP
   h. Oxygen supply lever - OFF
   i. Oxygen hose - SECURED TO STOWAGE FITTING
   j. Utility light - SECURED TO STOWAGE FITTING

COCKPIT INTERIOR CHECK

A thorough cockpit interior preflight shall be accomplished prior to each flight. The design features of the aircraft greatly simplify this task, but do not alleviate the requirement. Switch positions designated AS DESIRED allow pilot preference in switch/control positioning. AS REQUIRED indicates those switches that will differ with mission requirements. If no specific requirement exists, pilot preference may be used. Normally, those avionics switches designated AS DESIRED or AS REQUIRED should be OFF for start.

CAUTION

Do not place any item on the glare shield, as scratching the windshield is probable.

1. Interior check - COMPLETE
   a. Harness and personal equipment leads - FASTEN
      Attach parachute risers to harness buckles. Attach survival kit and ensure straps are snug within the limits of personal comfort. Secure and firmly adjust lap belt. Connect oxygen, G suit and communication leads. Check operation of shoulder harness locking mechanism.

WARNING

After connecting the parachute risers to the harness, lift the locking lever on each koch fitting and verify the actuating lever is full up and snug against the inner part of the locking lever. If the actuating lever will not seat properly, disconnect the release and use a different harness.

Left Console -

a. CC - OFF
b. Emergency air refueling handle/switch guard - DOWN

c. Integrated communications controls - AS REQUIRED

Before TO 1F-15-785:

  (1) Antenna select - AUTO
  (2) Guard receiver - ON
  (3) ADF - OFF
  (4) ICS - ON
  (5) Cipher switch - OFF

After TO 1F-15-785:

  (1) R2 and R1 antenna switches - AUTO
  (2) Radio 1 switch - G REC
  (3) ADF switch - AS REQUIRED
  (4) Volume control knob - AS DESIRED
  (5) Transmit switch - NORM
  (6) Mode knob - NORM
  (7) Frequency/channel - SET

d. KY-58 panel - SET
e. IFF antenna select switch - BOTH
f. IFF - ALL MODES OUT
  (1) Master mode - LOW/NORM
g. AAI - AS REQUIRED
h. EW panel - AS REQUIRED
i. External light controls - AS REQUIRED
  (1) Anti-collision - ON
  (2) Formation - OFF
j. Flap switch - UP
k. Throttles - OFF
l. Friction lever - AS DESIRED
m. Radar controls - AS DESIRED
  (1) Radar power knob - OFF
n. Fuel control panel - SET
  (1) Fuel dump switch - NORM
  (2) Wing switch - NORM
  (3) Center switch - NORM
  (4) Slipway switch - CLOSE
  (5) (F-15C/D) Conformal tank switch - STOP TRANS (NORM, with CFTs)
  (6) (F-15C/D) Conformal tank emergency transfer switch - NORM
  (7) (F-15C/D) External transfer switch - WING/CTR (AS DESIRED with CFTs)
o. NCTR enable switch - AS REQUIRED (some F-15C/D)
p. V-MAX switch - COVER CLOSED AND SAFETY WIRED
q. CAS switches - ON
r. Miscellaneous control panel - SET
  (1) Anti-skid switch - NORM
  (2) Inlet ramp switches - AUTO
  (3) Roll ratio switch - AUTO
  (4) Landing/taxi light switch - OFF
s. ILS/TACAN controls - AS REQUIRED
t. Canopy jettison handle - FORWARD
u. Emergency landing gear handle - IN
v. Arresting hook switch - UP

Instrument Panel -

a. Landing gear handle - DOWN
b. Pitch ratio switch - AUTO
c. VSD controls - AS REQUIRED
d. Master arm switch - SAFE
e. Fire/overheat lights - NOT PRESSED
f. Main communications controls - ON AND SET
g. HUD display control panel - AS REQUIRED

Ensure camera switch is not in RUN.

h. Select ASA thumbwheel - SET FILM ASA (some aircraft)
i. Gunsight camera control/video record panel - AS REQUIRED
j. Emergency jettison button - NOT PRESSED
k. Steermode knob - AS REQUIRED
l. Attitude reference selector knob - AS REQUIRED
m. Emergency brake/steer handle - IN
n. Standby attitude indicator - UNLOCKED
o. Circuit breakers - IN

Right Console -

a. Emergency vent handle - IN AND VERTICAL
b. Oxygen system - CHECK AND SET

Pressure - 55 to 120 psi

Regulator - CHECK

  (1) Oxygen supply lever - FULLY ON

  It is possible for the oxygen supply lever to stop at an intermediate position between OFF and ON. Assure the lever is all the way ON.

  (2) Emergency lever - NORMAL
  (3) MASK - ON

  Breath normally for 3 cycles and check flow indicator operation. Hold breath, all flow should stop and the indicator should show no flow (black). A white indicator indicates a leak which must be corrected before flight.

Indicator - CHECK

  (1) Diluter lever - 100%

- (2) Emergency lever - EMERGENCY
- (3) Oxygen flow - CHECK

Connections - CHECK

Emergency Oxygen - CHECKED
- (1) Pressure - CHECK
- (2) Actuating ring - STOWED and CHECKED

c. Anti-ice switches - OFF

d. Engine control panel - SET
- (1) Generator switches - ON
- (2) Emergency generator switch - AUTO
- (3) EEC/ENG CONTR switches - ON
- (4) JFS starter switch - ON
- (5) Engine master switches - ON

e. Temperature panel - AUTO and BOTH

f. INS mode knob - OFF

g. Interior lights controls - AS REQUIRED

h. TEWS Panel - AS REQUIRED

i. Countermeasures control panel - AS REQUIRED (some F-15C/D)

j. Compass control panel - AS REQUIRED
- (1) Latitude - SET
- (2) Hemisphere - SET

After Cockpit Check Is Complete -

VERIFY:

VERIFY items are those items which, if not correctly positioned, could cause a safety hazard and/or system damage.

1. Emergency air refueling handle/switch guard - DOWN
2. Throttles - OFF
3. Formation lights - OFF
4. Emergency landing gear handle - IN
5. Arresting hook switch - UP
6. Landing gear handle - DOWN
7. Master arm switch - SAFE
8. Emergency jettison button - NOT PRESSED
9. Emergency brake/steer handle - IN
10. Emergency vent handle - IN and VERTICAL
11. EEC/ENG CONTR switches - ON
12. Anti-ice switches - OFF
13. Avionics - OFF (CC, AAI, IFF, RADAR, ILS/TACAN, VSD, HUD, INS, TEWS)

STARTING ENGINES

Normal engine start procedure does not use external power. With the JFS running, power is available to operate the AMAD fire warning system, the intercom system between the pilot and the ground, and the cockpit utility light. Engine rpm and FTIT gages are inoperative until the emergency generator comes on line during engine start. The rest of the engine instruments are inoperative until a main generator comes on at about 44% rpm during first engine start. The EEC light may come on. The light should go out (if still on) when the EEC switch is cycled after engine start.

Because a JFS accumulator was discharged to start the JFS, the JFS LOW light will come on when power is available to light the caution panel. It will go out when accumulators are recharged by a running engine.

When the fingerlift is raised, the JFS will engage and accelerate the engine. JFS engagement is indicated by an audible decrease in JFS whine when the JFS clutch engages. JFS whine decrease is followed immediately by an increase to a higher pitch than before engagement. Engine rotation is apparent within approximately 5 seconds. If electrical power is not available, rotation can be felt and heard. If electrical power is available, rpm increase can be seen on the tachometer. The JFS will continue to smoothly accelerate engine rotation without hesitation until light-off occurs or steady-state windmill (23-30%) is reached. A normal start is indicated by rpm acceleration occuring before initial FTIT movement.

Monitor engine instruments and compare against the operating limitations listed in section V. After first engine start, the JFS automatically decouples from that engine and is ready for the second engine start. After second engine start, the JFS shuts down automatically.

The following procedure is applicable to either engine. The right engine is normally started first to permit checking utility hydraulic pressure with only the right pump operating.

JFS START

1. Engine master switches - CHECK ON

2. JFS switch - CHECK ON
3. JFS handle - PULL AND RELEASE
4. Starter READY light - ON (within 10 sec; 15 sec if temperature below 0°F)
5. Fire extinguisher switch - TEST

   Observe the AMAD fire warning light on and voice warning activated.

ENGINE START

1. Finger lift - RAISE AND RELEASE

   This engages the JFS to the engine.
2. Tachometer - OBSERVE INDICATING
3. Fire extinguisher switch - TEST

   Check all fire lights on and voice warning activated.
4. Throttle - IDLE (18%)
5. Engine instruments - CHECK

   Engine limits are contained in section V.
6. JFS deceleration - CONFIRM
7. Warning and caution lights - TEST
8. EMER BST ON light - OBSERVE ON

   The EMER BST ON light goes on after first generator comes on line to indicate both emergency generator and emergency boost pump are operating properly. After TO 1F-15-764, thirty seconds after the main generator comes on the line, the BST SYS MAL light also comes on as the emergency generator cuts off. This indicates that the emergency fuel boost pump is now operating off an abnormal power source. When the second main generator comes on the line, both EMER BST ON and BST SYS MAL lights go out.
9. Other engine - START
10. JFS - CONFIRM OFF; JFS SWITCH ON
11. ECS - CHECK

    Ensure ECS light off and airflow present.
12. Inlet ramp switches - CHECK AUTO
13. EEC switches - CYCLE (warning lights out)

    Confirm nozzle operation with the ground crew. Failure to cycle the EEC switches may cause abnormal engine operation later in the flight.
14. Engine anti-ice switch - AS REQUIRED

BEFORE TAXIING

1. CC - AUTO
2. INS - ALIGN (see INS alignment procedures)
3. Oxygen - CHECK
   a. Quantity - CHECK
   b. Oxygen test - Observe OXY LOW light at 2 liters (4 Liters for F-15B/D)
4. Fuel quantity gage - CHECK
   a. Tank quantities - CHECK
   b. BIT - CHECK
   c. Bingo bug - SET
5. Avionics - AS REQUIRED (AAI, RADAR, ILS/TACAN, VSD, HUD, TEWS)
6. Speed brake - CYCLE
7. Anti-G suit - CHECK OPERATION
8. Flaps - DOWN
9. Slipway door - CHECK (if air refueling is planned)
10. Trim - CHECK AND SET
    a. Trim pitch, roll, and yaw off neutral
    b. T/O trim button - PUSH

       Lateral stick and rudders should drive to center and longitudinal stick to takeoff position. The departure warning tone should beep.
    c. T/O trim light - ON
11. Flight controls - CHECK

    If the stick is cycled too rapidly or held in a corner for more than 3 seconds, the CAS may disengage. This is normal and will not occur in flight.
    a. Stick full aft and full left - Observe stabilator trailing edge up (left further up than the right) rudder left, left aileron up, right aileron down.
    b. Stick full forward and full left - Observe right stabilator leading edge moves into view and rudders move right (ailerons should not move).
    c. Stick full forward and full right - Observe left aileron moves down and right aileron moves up, rudders move left, and left stabilator leading edge in view.
    d. Stick full aft and full right - Observe stabilator trailing edge moves to full up (right higher than left) and rudder moves right (ailerons should not move).
    e. Rudder - Check. Hold stick neutral and paddle switch pressed. Move rudder pedals left and right and observe rudder travel.
12. CAS - RESET
13. Step 11 - REPEAT
14. Stick force sensor - CHECK

- a. Pitch ratio switch - EMERG (OBSERVE 0.4 PITCH RATIO)
- b. Pitch trim - FULL AFT UNTIL STABILATOR MOVEMENT STOPS (APPROXIMATELY 10 SECONDS)
- c. Stick - STRAIGHT FULL FORWARD AND HARD AGAINST FORWARD STOP (ZERO LATERAL INPUT)
- d. Observe root of both stabilator leading edges visible either with mirrors (canopy closed) or with seat full up (canopy open).
  If stabilator leading edges not visible, abort the flight.
- e. Pitch ratio switch - AUTO
- f. T/O trim - RESET
  During flight control and stick force sensor check, stabilator chatter may be noted. This is characterized by airframe vibrations during the flight control stick movement. Vibrations are normal if they stop within 3 to 4 seconds after flight control movement has stopped or cease when CAS is turned OFF.

15. VSD BIT - INITIATE (aircraft with OWS)
    Hold initiate pushbutton and move stick left and right and ensure stick force indication agrees. Ensure fuel indication is within ±800 pounds of gage. Failure of either check indicates an unreliable OWS.
16. Brakes - CHECK
    Have ground crew check the brakes while pumping the brake pedals.
17. Avionics systems - CHECK/PROGRAM
    Insert/verify NCI mission data. Program armament control panel. Initiate BIT as desired.
18. ACS/PACS - PROGRAM AS REQUIRED
    For MSIP aircraft, DTM transfer as desired.

WARNING

For the OWS to program properly, the external store configuration, including external tanks, must be set in the ACS/PACS panel.

19. Standby attitude indicator - CAGE
20. INS mode knob - INS (when aligned)
21. OWS overload severity codes - CHECK CLEARED
22. Altimeters - SET
23. Ejection controls safety lever - ARMED
24. JFS LOW light - OUT
25. BIT lights - CHECK
    Investigate any unusual BIT lights before taxiing.

TAXIING

Release brakes and advance power slightly if necessary. As aircraft starts to roll, apply brakes to check operation. When clear, actuate nose gear steering in both directions to ensure proper operation. During taxi, check all flight instruments. Due to excess thrust at idle power, taxi speed requires continual attention. At high gross weights, make all turns at minimum practicable speed and maximum practicable radius.

CAUTION

Nose gear damage can result during turns at high gross weight when using asymmetric thrust and/or asymmetric braking.

1. Brakes - CHECK
2. Nose gear steering - CHECK
3. Flight instruments - CHECK

BEFORE TAKEOFF

1. Radar - OPERATE
2. Harness - CHECK
   Ensure all buckles, straps, and fittings secure and properly adjusted.
3. Ejection controls safety lever - CHECK ARMED
4. Flight controls - CHECK FREE
5. Flaps - CHECK DOWN
6. IFF - AS REQUIRED
7. T/O trim - CHECK
   If the aircraft is manually trimmed nose down from takeoff trim, nosewheel lift-off speed may be increased.
8. Canopy - CLOSED AND LOCKED
   The canopy may bounce slightly as it lowers on canopy sill.

CAUTION

Ensure canopy has completed movement and wait 10 seconds before moving handle to LOCKED position. If there is a heavy load when attempting to place the handle in LOCKED, recycle the handle to DN and again perform locking procedure. Ensure canopy unlock light is on with handle in DN and goes out with handle in LOCKED. Ensure the handle is full forward.

9. Pitot heat - ON
10. Warning, caution, BIT lights, and circuit breakers - CHECK

TAKEOFF

Advance engines to 80% (on F-15C/D, some aircraft creep may occur) and check instruments. When ready for takeoff, release brakes and advance throttles to MIL or MAX as desired. Monitor engine instruments for proper operation, assuring that nozzles remain below 30% at MIL. For normal takeoffs, move the stick to approximately one-half aft stick at about 120 knots and rotate to approximately 10° pitch attitude. For maximum performance takeoffs (minimum ground roll), move the stick full aft at a speed below the nose wheel lift-off speed in figure A3-6 and rotate to 12° pitch attitude. With CFT's the aircraft has increased pitch response. Less aft stick is needed for rotation to takeoff attitude. Excessive aft stick can lead to high pitch rate and over rotation. For either takeoff technique, nose wheel lift-off speed and takeoff speed is increased for heavy gross weights and/or forward center of gravity. Additional aft stick will compensate for these effects, but rotation rates could be unacceptably high, leading to over-rotation. Retract gear and flaps when airborne.

NOTE

After TO 1F-15-763 but before TO 1F-15-791, the master caution and anti-skid warning lights will come on momentarily when the landing gear control handle is raised to the UP position.

AFTERBURNER OPERATION

During normal afterburner operation, observe exhaust nozzles open progressively with each afterburner segment; thrust and fuel flow increase proportionately. As throttles are advanced from minimum to maximum afterburner, the increase in thrust is fairly smooth and continuous.

CLIMB TECHNIQUES

MIL Power - Climb at 350 knots to 0.90 Mach, then maintain 0.90 Mach.

MAX Power - Climb at 350 knots to 0.95 Mach. If Mach increases above 0.95 at 40° pitch attitude, hold 40° and allow the Mach to increase. (Mach will rise only slightly before returning to 0.95.)

INFLIGHT

Continually monitor aircraft systems operation throughout the flight. Frequently check engine instruments, cabin pressure, oxygen system operation, fuel quantity (internal vs. total), and fuel transfer.

Optimum cruise and maximum endurance should be found in the performance data section and is attained by flying the correct Mach number for configuration and altitude. If the performance charts are not available and accuracy is not a significant factor, 12 units AOA may be used for optimum cruise and 14.5 units AOA may be used for maximum endurance.

AFTERBURNER TECHNIQUE

PW-100 Engine

Afterburner problems are the predominant cause of engine stagnation, particularly at high altitude low speed. Use of smooth positive throttle movement in the afterburner range will minimize these problems. Where the tactical situation allows, avoid selecting/terminating afterburner or other throttle transients in the afterburner range at very low speed and high altitude. When afterburner is required and the throttle is below military, a slight pause at military before selecting afterburner will increase the probability of an afterburner light. After an unsuccessful afterburner light, allow the engine to stabilize at military before again selecting afterburner. Confirm proper engine operation after selecting or deselecting afterburner.

PW-220 Engine

No special operating techniques are required.

FUEL MONITORING

With 3 external tanks installed, fuel transfer should be checked by selecting stop transfer on external wing tanks and observing fuel transfer from the centerline tank. When centerline transfer is confirmed the external wing tank switch should be returned to normal.

During low altitude/high speed flight, fuel consumption can be as high as 150,000 PPH (2500 pounds per minute) and may exceed fuel transfer capability. This will cause premature reduction of feed tank fuel level. Maneuvering and acceleration can cause fuel gage errors resulting in a fuel state over 1000 pounds less than gage indication. To avoid dangerously low fuel states as a result of these factors, maintain situation awareness, make more frequent fuel checks, and closely monitor feed tank fuel quantity.

With external tanks installed, an asymmetric external fuel imbalance may occur. Compare the internal fuel pointer with the total counter for indications of trapped external fuel. During sustained cruise power an external wing tank may not transfer fuel until after the other external wing tank is empty. The aircraft may be safely flown below 30 units AOA with an asymmetric load as great as one full external wing tank.

INSTRUMENT FLIGHT PROCEDURES

GENERAL

The HUD does not provide all the instruments required for instrument flight and should not be used as the sole reference.

RECOMMENDED AIRSPEEDS

The holding, penetration, and downwind airspeed for instrument approach may vary from those recommended. At normal approach gross weight, acceleration and high residual thrust characteristics of turbofan engines, combined with low aerodynamic drag, make precise speed control difficult. The recommended technique during instrument approach is to select a power setting which allows the aircraft to stabilize at the approximate recommended airspeed.

HOLDING

The recommended holding airspeed is 250 knots.

PENETRATION

Normally, after power is set (approximately 72%), lower nose to approximately 10° and allow airspeed to increase slowly to 300 knots. The speed brake can be used if a higher descent rate is required. Approaching final approach fix, slow to 200-250 knots and lower gear and flaps.

INSTRUMENT APPROACHES

In the pattern, select a power setting that will maintain 200 to 250 knots. Approaching final, lower gear and flaps, and slow the aircraft. Maintain on-speed AOA on final. The speed brake can be used to control descent and airspeed. On GCA final, the velocity vector can be used to indicate glideslope. If a 2 1/2° glideslope is used, holding 2 1/2° flight path angle with the velocity vector provides a good basis from which corrections, if required, can be made.

On an ILS approach, use of the bank steering bar in the ILS mode is not recommended until approximately aligned with the final approach heading. Bank steering information on the HUD and ADI automatically switches from 30°

All data on pages 2-10A thru 2-10B deleted.

maximum bank angle to the final approach mode of 15° maximum bank angle when the glideslope is intercepted. If the glideslope is intercepted with a considerable difference between aircraft heading and final approach course, a 15° bank angle may not be sufficient to align the aircraft on final approach. When an ILS mode is selected, CSET flashes on the HUD for 10 seconds to remind the pilot to set the final approach course. When the aircraft nears the center of the glideslope, GSUP or GSDN appears on the HUD. Interception of the center of the glideslope and automatic shift to approach mode is indicated by the disappearance of GSUP or GSDN and the appearance of glideslope indications on the HUD and ADI. Glideslope and localizer information is displayed on the ADI and HSI.

Use the best available range information. ILS-TCN normally provides the most accurate range information if the tacan station is suitably located. ILS-NAV mode provides range to the coordinates entered for the STEER TO destination.

On final approach, steer the velocity vector to the flight director cross. Velocity vector position on the pitch scale may be used to reduce the effect of an overly sensitive flight director cross (out of HUD limit). A flashing (caged) velocity vector may be used but it will not indicate the actual azimuth of the flight path.

MISSED APPROACH/ GO AROUND

Advance power as required and retract speed brake. Retract gear and flaps when climb is established.

DESCENT CHECK/BEFORE LANDING

Descents from high altitude may cause windshield fogging. The hot position should be selected before descent if fogging is anticipated.

a. Armament master switch - SAFE
b. Altimeter - SET

LANDING TECHNIQUE

The aircraft can accommodate several different landing techniques, however, the procedures described are recommended. Select ADI mode to display maximum landing pattern information on the HUD.

NORMAL LANDING

Approaching the break, set power to maintain altitude and airspeed (300 knots minimum). The speed brake may be used as required. On downwind, below 250 knots, lower gear and flaps.

During base turn, reduce speed to arrive on final at on-speed AOA (20-22 units). If faster than on-speed, the aircraft will float for considerable distance. If slower than on-speed, minor buffet may be noticed.

At the flare point, smoothly retard the throttles to IDLE and reduce rate of descent. Ground effect will cushion the aircraft, and touchdown may be difficult to recognize. Raising the nose too high in the flare will cause ballooning, and possibly a hard landing and tail/engine ground contact. For high gross weights, fly on-speed AOA, but delay reducing power until well into the flare (refer to section VI). After touchdown, maintain directional control with rudder and raise the nose to approximately 13° pitch attitude to achieve aerodynamic braking. With CFT's the aircraft has increased pitch response. Aerobraking is highly effective at airspeeds above 90 knots and significantly reduces the possibility of hot brakes, excessive tire wear, and blown tires. Therefore, aerobraking should be accomplished first followed by normal braking.

CAUTION

> Limit pitch attitude to 15° to avoid dragging the tail. The aircraft symbol (W on the HUD) will flash at 13°.

As the aerodynamic braking effect decreases, lower the nose and apply brakes as required (at high gross weight, or forward CG, the nose will begin to fall at proportionally higher airspeeds, refer to section VI). Due to high idle thrust, the aircraft may not decelerate after the nose wheel is on the ground unless braking is used.

CROSSWIND LANDING

Landing is not recommended if the 90° crosswind component exceeds 30 knots. Fly a normal pattern adjusted to avoid excessively steep or shallow base turns. On final, establish a wings-level crab to counteract drift and maintain the flight path straight down the runway. It may be necessary to adjust power or delay throttle reduction in the flare to avoid abrupt sink rates or counteract the effects of turbulence. In gusty or turbulent conditions, use normal on-speed AOA; however, AOA deviations are more critical. Hold the crab through touchdown. After touchdown, maintain ground track with rudder. Use aileron into the wind to maintain a wings-level attitude. After touchdown, if the crosswind component exceeds 25 knots, do not increase pitch attitude to greater than 10°. If directional control becomes difficult, lower the nose and brake in a three-point attitude.

MINIMUM RUN LANDING

When stopping distance is critical, fly final at 23 units AOA, and use a flatter approach angle (1 1/2° - 2°). Precise control of the touchdown point can be achieved using the velocity vector. If runway is dry, lower nose after touchdown and commence maximum anti-skid braking. Maximum anti-skid braking is achieved by applying maximum pedal pressure. See section VII for slippery runway techniques.

NO FLAP LANDING

No flap landings require no special technique. Approach speed is slightly faster at on-speed AOA and the aircraft is more sensitive in pitch. Allow for higher pitch attitude and slower deceleration on final.

AFTER LANDING

1. Ejection controls safety lever - LOCKED
2. Speed brake - IN
3. Flaps - UP
4. Slipway - CHECK
5. IFF mode switches - OUT
6. Mode 4 function switch - HOLD MOMENTARILY
7. Radar power switch - STBY
8. Trim - T/O
9. Landing/taxi light - AS REQUIRED
10. Formation lights - OFF
11. Pitot heat, windshield anti-ice switches - OFF

SINGLE-ENGINE TAXI

1. Avionics - OFF (CC, AAI, ILS/TACAN, VSD, HUD, TEWS, RADAR)
2. Either throttle - OFF
3. Corresponding engine master switch - OFF

   Placing the engine master switch OFF resets the automatic avionics shutdown system.

HOT REFUELING

Stop short of the refueling area for tanks/stores safety check. If suspected hot brake or other unsafe condition exists, do not enter refueling area. Consider all available methods of escape should a fire or other emergency occur. Taxiing clear, ground egress, and static ejection are some of the options available. Follow ground crew directions into the refueling area, and establish communications with the ground crew. If you suspect a malfunction stop refueling. Do not transmit on UHF except in an emergency. After refueling complete and when cleared by ground crew, taxi clear of the area. Do not use high power in congested areas.

Before Refueling -

1. After landing checklist - COMPLETE
2. Avionics - OFF (CC, AAI, ILS/TACAN, VSD, HUD, TEWS, RADAR)
3. Slipway switch - CLOSED (F-15A/B); OPEN (F-15C/D)
4. Left throttle - OFF
5. Left engine master switch - OFF
6. Canopy - CLOSED

   Hot refueling with the canopy closed provides maximum protection in the event of a fire.
7. Fuel quantity - NOTE

During Refueling -

8. Keep hands visible to refueling supervisor.

   Be prepared to shut down engine and evacuate aircraft or taxi clear of area as directed by ground crew if an emergency occurs.

After Refueling -

9. Fuel quantity indicator - CHECK AND NOTE TOTAL QUANTITY

ENGINE SHUTDOWN

1. Slipway switch - CLOSE (if required)
2. INS - OFF
3. Video record switch - STBY 10 SECONDS, THEN OFF (some aircraft)
4. Avionics switches - OFF
   Turn avionics OFF before shutting down engines to prevent false BIT warnings on the status panel.
5. UHF 2 mode selector switch - MAN (F-15C/D thru 79-0081)
6. Engine anti-ice switch - OFF
7. Throttle(s) - OFF AFTER 15 SECONDS
   Wait 15 seconds after INS shutoff before placing throttle(s) off. After the last generator is off and before the emergency generator drops off the line, ensure that the L and R GEN OUT lights and the landing gear indicator lights come on. Illumination of these lights indicates that the generator failure circuit is functioning and the emergency generator is supplying both AC and DC essential power.

PACS PANEL JETTISON PROGRAMMING

1. ARMT menu - SELECT
2. CBT JETT display - SELECT
3. Select JETT knob - OFF or COMBAT
4. 1 select button - PRESS
   a. 1 is boxed and 2 is unboxed.
5. Select aircraft station(s) for first press of JETT button.
   a. Weapon on selected station is boxed.
6. Select RACK, STORE or PYLON for first press of JETT button.
   a. Selected suspension is boxed.

NOTE

The STORE legend is boxed when display is selected.

7. To enter combat 1 selection in CC memory, ENTER button - PRESS
   a. Box is removed from 1 and existing program adjacent to CBT 1 is replaced with new program.
8. To change combat 2 program, press 2 button and repeat procedure for combat 1 as 2 is boxed.

OWS MATRIX DISPLAY.

1. DATA SELECT switch - CCC
2. DEST DATA switch - M2

To display the OWS matrix -

3. Type R, 1, 0, ENTR

To clear the OWS matrix -

3. Type R,1,1,ENTR
   This enables maintenance personnel to reset the OWS latch on the ASP in the nose wheelwell.

WARNING

To prevent injury, do not clear maintenance personnel to enter the nose wheelwell unless one engine is shut down.

INS PROCEDURES

DATA FORMATS

Data must be entered in the NCI in the correct format. In general, an alphabetical prefix is required to identify the data being entered. When a digit is typed, it appears in the right window of the applicable DRD. Previously typed digits are shifted left each time a new digit is typed. Various units (degrees, minutes, decimals) are assigned to specific windows in the DRD, according to the applicable format. For example, if the format is nautical miles and tenths, the digit appearing in the last window is identified as tenths. Therefore, all digits (including trailing zeros) must be entered.

Latitude/Longitude

Type hemisphere, degrees, minutes, and tenths of minutes.

1. For 34°56.0′ north latitude, type N34560.

Elevation

Type + or − (above/below sea level), elevation in feet.

1. For 1250 feet above MSL, type +1250.

Magnetic Variation

Type east or west, degrees, minutes, and tenths.

1. For 12°15.5′ east variation, type E12155.

Offset Data

RANGE

Type offset range in nautical miles and tenths.

1. For 15.0 nautical miles, type R150.

BEARING

Type bearing in degrees (true).

1. For 155° true bearing, type B155.

DISTANCE

Type true direction/distance in feet.

1. For 15,250 feet north, type N15250.

Wind

SPEED

Type wind speed in knots.

1. For 65 knots, type R65.

DIRECTION

Type true direction (bearing) in degrees.

1. For wind from 185° true, type B185.

DATA ENTRY/DISPLAY

Data may be entered any time the NCI mode selector knob is in CCC, STBY, or any ALIGN or NAV mode. The CC must be on to enter or display any data except present position. Data is retained in CC memory (with or without electrical power) until new data is entered. Before data may be entered, the keyboard must be enabled by pressing the RDY pushbutton to illuminate it. Prefix letters (N, S, +, etc.) blank the DRDs and allow data entry. As data is typed, it appears in the DRDs. No data is entered from the NCI to the CC or INS until the ENTR pushbutton is pressed. When entering data, the ENTR pushbutton should be firmly pressed. After data entry, the RDY pushbutton should be pressed again to disable the keyboard and prevent inadvertent inputs.

Wind

Computed wind may be displayed any time the INS is operating and the mode selector knob is in INS or TCN. Wind may be entered only when A/D mode is selected or if the INS fails completely.

1. Data select knob - WIND
   Computed/stored wind appears in the DRDs.
2. Type B, wind direction, ENTR
   Wind direction appears in the right DRD.

3. Type R, wind speed, ENTR
   Wind speed appears in the left DRD.

Magnetic Variation

Mag var accuracy is dependent on aircraft location, proximity to structures and equipment, and individual aircraft characteristics. During normal operation mag var is computed in the CC as the difference between INS true heading and AHRS magnetic heading. The computed mag var is stored in the CC at the time of equipment shutdown. Mag var must be checked prior to BATH alignment. If M/V is not within 30 minutes of the desired M/V, the correct mag var should be entered. Stored mag var may be read out anytime prior to alignment by placing the NCI mode select knob to STBY and the data select knob to M/V (CC on). With the NCI mode selector in INS or TCN and the INS operating, the AHRS must be in DG or COMP (or be failed) to enter mag var. Mag var may be entered anytime the NCI mode select knob is in A/D. In flight, M/V found from navigation charts is sufficiently accurate. On the ground, an accurate mag var may be read out following a GC alignment (readout fluctuations are normal).

1. Data select knob - M/V
   Stored M/V appears in the right DRD. If tacan data is being entered, this step is not required.
2. Type M/V, ENTR

Present Position

1. Data select knob - PP
   If the INS is operating, DRDs indicate present latitude and longitude in the left and right DRD, respectively. For alignments, the DRDs must indicate zeros before present position may be entered.

NOTE

If B is selected on the destination data counter, the present position data is stored as base destination. If no destination reference is desired for this data, select 1 thru 11 or M1 thru M3 on the destination data counter.

2. Type present latitude, ENTR
   When the hemisphere is typed, all windows in the left DRD blank except for the left window (which indicates the hemisphere). When ENTR is pressed, the DRDs count up to the entered coordinates. The displayed coordinates may vary slightly (one or two tenths) from what was entered. It is not necessary to wait until counting is complete before proceeding with longitude entry.
3. Type present longitude, ENTR
   Indications are identical to those for latitude. The right DRD indicates longitude.

Destination Data

1. Data select knob - DEST
2. Dest data counter - SET
   DRDs indicate stored latitude and longitude for the select destination.
3. Type latitude, ENTR
   Indications are identical to present position entry, except that pressing the ENTR pushbutton will have no visible effect (DRDs will not count up), except that leading zeros will be displayed.
4. Type longitude, ENTR
5. Type A
   Stored destination altitude (elevation) appears in the right DRD. The left DRD is blank.
6. Type destination elevation, ENTR (if required).
   The right DRD indicates the entered elevation, and will not change when ENTR is pressed. Enter elevation for air-ground weapons delivery or other missions where target designation is required. If no elevation is in CC memory, zero elevation will be assumed.

Offset Data

Enter offset data required for the mission with respect to a destination previously stored. Entry of new destination latitude or longitude will clear stored offset information for that destination.

1. Data select knob - O/S
   Stored offset data appears in the DRDs. If offset is in range and bearing, range

appears in the left DRD, and true bearing appears in the right DRD. If offset is in feet, N/S and E/W, feet will appear in the left and right DRDs, respectively.

2. Dest data counter - SET

To enter offset in range and bearing

3. Type range, ENTR
   Range appears in the left DRD.
4. Type bearing, ENTR
   Bearing appears in the right DRD.

To enter offset in feet

3. Type N/S distance, ENTR
   N/S offset appears in the left DRD.
4. Type E/W distance, ENTR
   E/W offset appears in the right DRD.
5. Type A
   Stored elevation appears in the right DRD. Destination elevation will be assumed for the offset unless elevation is entered.
6. Type offset target elevation, ENTR (if required)
   Entered elevation appears in the right DRD.

Tacan Data

Twelve tacan stations may be stored in addition to the twelve destinations. The data is used for tacan navigation or updates. The + and − keys denote X or Y band respectively. Do not enter two stations of the same channel and band. The update pushbutton sequences the data entry.

1. Data select knob - CCC
2. Dest data counter - SET
   Dest data number for each station is immaterial, since the number is used only to label data position in the CC. Stored channel number appears in the left DRD.
3. Type + or −, channel, ENTR
   Channel number appears in the right DRD.
4. Update pushbutton - PRESS
   Stored latitude and longitude appear in the DRDs.
5. Type tacan station latitude, ENTR
6. Type tacan station longitude, ENTR
7. Update pushbutton - PRESS
   Stored tacan station elevation appears in the right DRD.
8. Type + or −, tacan station elevation, ENTR
9. Update pushbutton - PRESS
   Stored tacan station M/V appears in the right DRD.
10. Type tacan station M/V, ENTR
    A subsequent pression of update pushbutton calls up tacan channel display.

Mission Data

Mission data is entered in the CC for HUD film/VTRS titling and signal data recorder (SDR) documentation. Index 5 and index 6 are not recorded by the SDR. The program is entered by selecting M2 on the destination select counter, CCC on the data select knob, and then typing R and any index number from 1 to 6. The update pushbutton sequences to the next higher index. Any index may be called up by typing R, the index number, ENTR.

Mission data is entered in four-digit maximum groups except index 5 which is a two-digit group. The following index definitions should be used:

a. INDEX 1 (month, day) - the month is a two-digit entry, 01-12; the day is a two digit number, 01-31, leading zero is required.

b. INDEX 2 (year-mission code) - The year is the last two digits of the year; the mission code is a two-digit number from the mission code table, leading zero is required. The code depends on mission, ECM pod loading, and AIM-7 simulator plug installation.

c. INDEX 3 (aircraft number) - The aircraft number is the last digit of the year and the last three digits of the full serial number (e.g., 78-0496 is entered as 8496).

d. INDEX 4 (unit number) - The unit number is the maintenance AMU to which the aircraft is assigned.

e. INDEX 5 (local use) - As assigned locally, two digits maximum.

f. INDEX 6 (local use) - As assigned locally, four digits maximum.

After INDEX 6 has been programmed, pressing the update pushbutton will exit the update routine and return the HUD display to normal. If film/VTR titling is desired, the camera/VTR must be run before pushing the update pushbutton with INDEX 6 showing on the left DRD.

When determining the proper mission code, select the code which describes the primary purpose of the sortie and reflects those events actually flown. For example, one or two instrument approaches may be made after an ACBT mission; but, the primary purpose of the mission was ACBT and code 04, 14, 24, or 34 should be used. If the ACBT was not flown due to weather, the code should be changed to reflect instruments, intercepts, etc., as appropriate. For multi-role missions or those which could use more than one code, the order of priority for code selection is: air-to-ground, air combat training, intercepts, all other codes.

1. Dest data counter - M2
2. Data select knob - CCC
3. Type R, index

   Index number appears in the left DRD. Normally, index 1 is selected first.

4. ENTR pushbutton - PRESS

   Data stored in the selected index appears in the right DRD and all mission data appears on the HUD.

To enter new data -

5. Type B, data, ENTR

   Entered data appear in the right DRD and HUD display is updated to reflect the new entry.

To step to the next index -

6. Update pushbutton - PRESS

   The next index and stored data appear in the DRDs. Data may be entered, if desired, as in step 5.

To title film -

7. Camera switch - RUN (3 seconds)

MISSION DATA INDICES

INDEX	DATA	EXAMPLE (DRD)
1	Month, day	0318
2	Year, mission code	8506
3	Aircraft number	0032
4	Unit number	0405
5	Local use	0069
6	Local use	0043

MISSION CODES

CODE (W/O ECM pod)	CODE (With ECM pod)	Mission
01(11)	21(31)	Live fire gun (A/A)
02(12)	22(32)	Live fire missiles
03(13)	23(33)	Intercept
04(14)	24(34)	ACBT (camera only)
05(15)	25(35)	Air-to-Ground
06(16)	26(36)	Instruments Navigation
07(17)	27(37)	Transition Proficiency
08(18)	28(38)	FCF
09(19)	29(39)	Target Tow

Codes in parenthesis ( ) are to be used when AIM-7 simulator plugs are installed and dummy AIM-7s are not carried.

ALIGNMENTS

When the NCI mode selector knob is placed in an ALIGN mode, the following occurs:

a. The INS begins a warmup and coarse align period. The warmup period varies from a few seconds during normal conditions to approximately two minutes in extremely cold temperatures.
b. After warmup, the gyros spin up.
c. The INS locates true north. If the mode selector knob is in GC, the INS

uses AHRS magnetic heading and magnetic variation from the CC to find approximate true north (BATH). If the mode selector knob is in STOR, the INS uses the true north determined during last GC alignment. These actions take place during the coarse align period.

d. The NCI is enabled to accept present position which may be entered at any time after warmup and during the coarse align period. Present position is entered directly into the INS.
e. After approximately 1-1/2 to 3 minutes (providing present position has been entered), the ALN light comes on. If the mode selector knob is in STOR, the light flashes, indicating that alignment is complete. If GC is selected, the ALN light will be steady, indicating the end of BATH alignment and the beginning of fine align (gyro-compass) period.
f. If the mode selector knob is in GC, the INS begins a fine align period after the steady ALN light comes on. During this period, the INS uses the earth's rotation rate, gravitational field and present position to find an exact true North independent of the AHRS or any other system inputs. This period takes approximately 6-1/2 minutes.
g. Near the end of the fine align period, the INS enters a gyro bias period. During this time, corrections are computed which bias the gyros to remove residual errors. The gyro bias period continues until a NAV mode is selected. If the aircraft is moved while the bias operation is in progress, the biases will rapidly change to erroneous values. Usually, maintenance action is required to re-bias the INS in order to obtain usable INS operation.
h. When fine align is complete, the ALN light flashes. Placing the mode selector knob to a NAV mode removes power

to the align and bias circuits and the ALN light goes out.

If the INS is shut down before the ADI sphere erects (INS selected on the ADI), leave the switch off for 5 minutes to prevent damage to the gyros. If the INS is shut down after ADI sphere erection (INS selected), leave the switch off for 15 seconds before initiating another alignment. Do not switch to GC or STOR after switching to a NAV mode as this degrades the alignment.

GC Alignment

The GC alignment is the most accurate alignment procedure. It takes 9-1/2 to 14 minutes, depending on temperature. The CC may be on or off. Only present position must be entered. If the CC is off, or if the CC is on and the stored magnetic variation is inaccurate, alignment time may be slightly increased. Magnetic variation may be entered, but is not required for a full GC alignment. Rapid align aircraft differ from the normal align aircraft in that after the align light has come on steady it begins flashing slowly after 6 or 7 minutes. This indicates that alignment is accurate enough for the system to be switched to the INS mode if desired.

Before rapid alignment capability -

1. Mode selector knob - GC
   DRDs illuminate. Wait until DRDs indicate zeros.
2. Present position - ENTR
   DRDs count up to entered present position.
3. ALN light - OBSERVE STEADY (After approximately 3 minutes).
   The steady ALN light indicates that the INS completed BATH alignment and has entered its fine align (gyro compass) period.
4. ALN light - OBSERVE FLASHING (After 9-1/2 to 14 minutes).
   The flashing align light indicates alignment is complete.
5. Mode selector knob - INS
   DRDs indicate computed present position. The ALN light goes out.

After rapid alignment capability -

1. Mode selector knob - GC
   DRDs illuminate. Wait until DRDs indicate zeros.
2. Present position - ENTR
   DRDs count up to entered present position.
3. ALN light - OBSERVE STEADY (Approximately 1-1/2 to 3 minutes).
   The steady ALN light indicates that the INS completed BATH alignment and has entered its fine align (gyro compass) period.
4. ALN light - SLOW FLASHING (at 0.7 Hz rate, after 6 to 7 minutes).
   The slow flashing light indicates that the INS has reached a 4NM/HR CEP accuracy and the mode selector knob can be placed to INS if a rapid alignment is desired.
5. ALN light - FAST FLASHING (after approximately 9½ minutes).
   The fast flashing light indicates that a full alignment is complete and the INS has a 2NM/HR CEP accuracy.
6. Mode selector knob - INS
   DRDs indicate computed present position. The ALN light goes out.

Stored Alignment

Stored alignments give nearly the same accuracy as GC alignments and take approximately three minutes. Before a stored alignment, a GC alignment is required. When the flashing align light is observed during the GC alignment, turn the NCI mode selector knob directly to OFF without going to INS. After 15 seconds, remove electrical power and do not move the aircraft.

1. Mode selector knob - STOR
   DRDs illuminate. Wait until the DRDs indicate zeros.
2. Present position - ENTER

3. ALN light - OBSERVE FLASHING (in approximately 1-1/2 to 3 minutes)
   The flashing ALN light indicates alignment is complete.
4. Mode selector knob - INS
   DRDs indicate computed present position. The ALN light goes out. Do not hesitate in GC position, since a GC alignment will be initiated.

BATH Alignment

BATH alignment is the least accurate alignment, and takes approximately 3 minutes. Present position must be entered. Magnetic variation must be entered if stored M/V is not accurate. When entering M/V, it must be entered in STBY mode. Accuracy of a BATH alignment depends on the M/V accuracy and the length of time the INS is permitted to align. The mode selector knob may be placed in a NAV mode at any time after the steady ALN light comes on. Any delay after this time gives a partial GC alignment, which usually increases the accuracy of the alignment.

1. Mode selector knob - STBY
2. Data select knob - M/V
   Stored M/V appears in the right DRD.
3. Magnetic variation - ENTER (if required)
4. Mode selector knob - GC
   Wait until DRDs indicate zeros.
5. Present position - ENTR
   DRDs count up to entered present position.
6. Mode selector knob - INS (after steady ALN light comes on).
   DRDs indicate computed present position.

UPDATES

INS present position may be updated by comparison with tacan data, visual position, or radar ground target position. When the data select knob is placed in an update position, the DRDs indicate N/S and E/W errors (in nautical miles and tenths) as follows:

a. Tacan update. If the tacan is set to receive a station stored in tacan data, the DRDs show distances from INS present position to tacan derived present position.
b. Visual update. The DRDs show the distances from INS present position to the coordinates of the destination selected in the steer counter.
c. Radar update. With the radar in ground map mode, the DRDs indicate the distances from INS present position to radar derived present position. Radar present position is found by locating and designating a radar identifiable destination set in the steer counter. In any update mode, the errors may be monitored at all times without changing INS data. If tacan or radar update is selected, pressing the update pushbutton changes INS present position to tacan or radar derived present position. If VIS update is selected, visually position the airplane over the destination selected in the steer counter, and press the OVRFLY FRZ pushbutton. This stores and displays the error existing at the time the pushbutton was pressed. If the update pushbutton is then pressed, this error is entered in the CC to change present position by that amount. If update is not desired, pressing the CLR pushbutton or selecting a different data select position will clear the error data.

Tacan Update

1. Tacan - SET
   Set tacan controls to receive a station previously stored in tacan data.
2. Data select knob - TCN
   DRDs indicate errors.

If update is desired -

3. Update pushbutton - PRESS
   DRDs indicate zero error.

Visual Update

1. Steer counter - SET
   Set the destination number of the update point.
2. Data select knob - VIS
   DRDs indicate errors.
3. OVRFLY FRZ pushbutton - PRESS (with aircraft over update point).
   DRDs freeze at the existing error.

If update is desired -

4. Update pushbutton - PRESS
   DRDs blank. To perform another visual update, deselect and again select VIS.

Radar Update (Before Doppler Beam Sharpening) (DBS)

1. Data select knob - RDR
2. Radar mode control switch - MANUAL
3. Radar mode knob - MAP
4. A/G master mode - NOT SELECTED
   Selection of A/G mode inhibits the radar update function.
5. Steer counter - SET
   Set the destination number of the radar identifiable update point.
6. TDC - PRESS, POSITION CURSOR, AND RELEASE.
   Position the VSD cursor over the radar target. The target is designated when the TDC is released. The DRDs indicate errors.

If update is desired -

7. Update pushbutton - PRESS
   DRDs indicate zero error.

Radar Update (After Doppler Beam Sharpening)

Refer to TO 1F-15C-34-1-2 for a detailed description of the DBS mode.

1. Data select knob - RDR
2. Radar mode control switch - AUTO
3. Master mode - ADI
4. Radar mode knob - MAP
5. Steer counter - SET
   Set the destination number of the radar identifiable update point
6. Steering mode - NAV
   Read distance to destination in the HSE range indicator.
7. Radar range scale - SET
   Set range scale so that the DBS display includes the destination range (80 NM maximum). The DBS display will include the area between 1/2 the selected range scale and the selected range scale. If destination range is less than 40 NM, the VSD target designator (triangle) will automatically appear. If destination range is greater than 40 NM, pressing and releasing the TDC will call up the target designator.
8. Map elevation - SET
   Map elevation is displayed in the VSD BIT readout window (PPI display only) and may be set using the radar elevation knob.
9. DBS mode - AS DESIRED
   Select SECTOR or EXPAND as desired. Range scale must be set to 40 NM or less to select SECTOR or EXPAND.
10. TDC - PRESS, POSITION TARGET DESIGNATOR, RELEASE
    Position the VSD target designator (top corner of the triangle) at the radar destination. The destination is designated when the TDC is released. The DRD's indicate errors.

If update is desired -

11. Update pushbutton - PRESS
    DRD's indicate zero error.

Doppler Radar Wind

1. Master mode switch - A/G
2. NCI mode selector knob - A/D or TCN
3. Radar mode control - MAN
4. Radar mode selector knob - DOPPLER
5. Maintain straight and level flight for 6 seconds minimum.
6. NCI data select knob - WINDS
   The NCI now shows doppler winds and VSD shows doppler ground speed. To retain the last doppler wind in the CC (bad INS groundspeed, etc.), maintain the A/D mode. The radar mode selector and NCI data select may now be used as desired.

PRESET CHANNEL ADJUSTMENTS (F-15A/B THRU 76-0142)

1. Aux manual frequency selector knobs - SELECT NEW FREQUENCY
2. Aux channel selector knob - SELECT CHANNEL TO BE ENTERED
3. Communication mode select switch - CHAN
4. Channel select pushbutton - PUSH
   The selected channel now has the new frequency for both aux and main operation.

PRESET CHANNEL ADJUSTMENTS (F-15A/B 77-0061 AND UP, AND F-15C/D THRU 79-0081)

1. UHF 2, manual frequency selector knobs - SELECT NEW FREQUENCY
2. UHF 2 channel selector knob - SELECT CHANNEL TO BE ENTERED
3. UHF 2 mode selector switch - CHAN
4. Channel set pushbutton - PUSH
   The selected channel now has the new frequency for UHF 2. This also sets the new frequency for the selected channel in the main communication control panel (UHF 1) on the main instrument panel.

PRESET CHANNEL ADJUSTMENTS (AFTER TO 1F-15-704)

UHF 1 Preset Channels

To insert a new frequency in one of the 20 preset channels for UHF 1, proceed as follows:

1. ICCP manual frequency selector knobs - SELECT NEW FREQUENCY
2. ICCP channel selector knob - SELECT CHANNEL TO BE ENTERED
3. ICCP mode selector switch - CHAN
4. Channel set pushbutton - PUSH
   The selected channel now has the new frequency for UHF 1. This also sets the new frequency for the selected channel in the main communication control panel (UHF 1) on the main instrument panel.

UHF 2 HAVE QUICK Control Panel Preset Channels

To insert a new UHF 2 frequency in one of the 14 normal mode preset channels or in one of the 6 AJ mode preset channels, proceed as follows:

1. T-2-3-A selector knob - SELECT 2 or 3
2. Manual frequency selector knob - SELECT NEW FREQUENCY
3. Preset channel selector knob - SELECT CHANNEL TO BE ENTERED
4. Mode selector knob - PRE
5. Set pushbutton - PUSH

PRESET CHANNEL ADJUSTMENTS (AFTER TO 1F-15-806)

R2 Preset Channels

To insert a new frequency in one of the 20 preset channels of R2, proceed as follows:

1. ICCP R2 mode selector knob - CHAN
2. Channel set switch - R2 MOMENTARILY
   The frequency/JTIDS indicators and channel indicators display the last frequency programmed in R2.
3. R2 channel selector knob - CHANNEL TO BE PROGRAMMED
4. Frequency/JTIDS selector knobs - SET NEW FREQUENCY
5. Channel set switch - R2 MOMENTARILY
   The display on the frequency/JTIDS indicator goes blank indicating the frequency is inserted.
6. To verify frequency, frequency display switch - R2
   New frequency momentarily displayed on the frequency/JTIDS indicators.

R1 Preset Channels

To insert a new frequency in one of the 20 preset channels of R1, proceed as follows:

1. ICCP R2 mode selector knob - CHAN
2. Channel set switch - R1 MOMENTARILY
   The frequency/JTIDS indicators and channel indicators display the last frequency programmed in R1.
3. R2 channel selector knob - CHANNEL TO BE PROGRAMMED
4. Frequency/JTIDS selector knobs - SET NEW FREQUENCY
5. Channel set switch - R1 MOMENTARILY
   The display on the frequency/JTIDS indicator goes blank indicating the frequency is inserted.

   To verify new frequency –
6. Set UHF 1/R1 to channel just programmed.
7. Frequency display switch - R1.

   New frequency momentarily displayed on the frequency/JTIDS indicator.

KY-28 CHECKS

NOTE

> The cipher zero switch should not be placed to ZERO except in emergencies. If the switch is inadvertently placed to ZERO, the speech security unit is disabled and a steady 1200 Hz tone is heard in the headset.

The KY-28 unit automatically performs two checks: a turnon alarm check and a continuous monitor of the encryption while the KY-28 is in use. A 2 second check occurs when the KY-28 unit is initially turned on (cipher radio selector switch to UHF 1/COMM or UHF 2/AUX). During this check, a steady 1200 Hz tone is heard in the headset. If the system is operational, the steady tone is interrupted as a 2.3 Hz rate to produce a beeping tone. Momentarily pressing the microphone button clears the beeping tone and causes the KY-28 unit to switch to the standby condition. If the unit fails to pass this check, the steady tone continues and the speech security system cannot be used. The second check occurs while the microphone button is pressed during enciphered transmission. If an encryption failure is detected, enciphered transmissions are prevented and the 1200 Hz beeping tone is heard in the headset.

NOTE

If a failure is detected during either the turnon alarm check or the encryption check, place the cipher switch to OFF.

KY-28 Turnon Alarm Check

1. UHF comm controls - SET
    a. UHF 1/COMM and UHF 2/AUX radios - ON
    b. ADF switch - OFF
    Set the UHF communications system controls as required for conventional (noncipher) operation.

NOTE

The cipher zero-norm switch should not be placed to ZERO except in emergencies to decode the KY-28. If the switch is inadvertently placed to ZERO, the speech security unit is disabled and a steady tone will be heard when the KY-28 unit is energized.

2. Cipher radio selector switch - UHF 1 (or COMM)
3. Monitor tone.
    A steady tone is ON for approximately 2 seconds, then changes to a beeping tone.
4. Microphone button - PRESS/RELEASE (tone off)
    Beeping tone ceases. The system switches to standby and is ready for cipher transmission or reception.

NOTE

If the steady tone (step 3) or beeping tone (step 4) continues for longer than 2 seconds, the KY-28 unit is malfunctioning. If actuating the microphone button does not clear the tone, cipher operation is inhibited. The cipher radio selector switch is placed OFF for conventional operation.

5. Repeat turnon alarm check with cipher radio selector switch in UHF 2 (or AUX).

KY-28 COMMUNICATIONS

Non-cipher

1. Cipher radio selector switch - OFF
    Transmit and receive UHF communications in the normal manner.

Cipher

1. Cipher radio selector switch - UHF 1/COMM or UHF 2/AUX
    The turnon alarm check is repeated if cipher radio selector switch was previously OFF. Momentarily actuate microphone button to clear beeping tone if check is repeated. Enciphered receptions are automatically decoded and supplied to the headset in plain language audio. Uncoded message receptions automatically bypass the KY-28 deciphering circuits and are sent to the headset.
2. To transmit cipher, press mic button, monitor for short beep, then speak.
    Approximately 0.5 second after pressing the mic button, a beep tone is heard in the headset indicating the system is ready to encipher the transmission. Release the microphone button upon completion of the message.

EXTERNAL POWER START (Following cockpit interior check)

If external power is to be used more than 2 minutes before starting engines, ensure all switches are in AUTO except CC in OFF. If cooling air is available, avionics may be on as desired.

1. External power switch - RESET

NOTE

If finger lifts are raised with electrical power on the aircraft and engine master switches ON, an engine will engage without command as the JFS starts.

2. Fire extinguisher switch - TEST
3. Warning and caution lights - TEST

JFS START

1. Engine master switches - CHECK ON
2. JFS switch - CHECK ON
3. JFS handle - PULL AND RELEASE
4. JFS READY light - ON (within 10 seconds)

ENGINE START

1. Right throttle finger lift - RAISE AND RELEASE
2. Right throttle - IDLE (18%)
3. Engine instruments - CHECK
4. JFS deceleration - CONFIRM
5. External power - DISCONNECT
6. EMER BST ON light - OBSERVE ON
   The EMER BST ON light does not come on with external power applied. When external power is disconnected the EMER BST ON light comes on. After TO 1F-15-764, when external power is disconnected the EMER BST ON light and BST SYS MAL light come on immediately. This condition is normal and both lights will go out after the second main generator comes on the line. To check the emergency generator/emergency boost pump system, cycle the emergency generator switch to MAN and then back to AUTO. The BST SYS MAL light goes out and the EMER BST ON light remains on while the switch is in MAN.
7. Left engine - START (steps 1 thru 3)
8. JFS - CONFIRM OFF; JFS SWITCH ON
9. ECS - CHECK
   Ensure ECS light is off and airflow is present.
10. Inlet ramp switches - CHECK AUTO
11. EEC switches - CYCLE (Warning lights out)
    Failure to cycle the EEC switches may cause abnormal engine operation later in the flight. See EEC Malfunction, section III.
12. Engine anti-ice switch - AS REQUIRED

BEFORE TAXI

Continue with normal procedures.

SCRAMBLE

AIRCRAFT SETUP

1. Complete the Before Flight procedures through Before Taxiing.
2. When the INS has aligned in GC (flashing light), go to OFF without going to INS.
3. Perform Engine Shutdown procedure.
4. Ejection controls safety lever - LOCKED
5. INS mode select knob - STOR
6. Avionics switches - ON (EXCEPT RADAR)
7. Do not move the aircraft.

If these actions have not been accomplished, use normal prodecures.

JFS/ENGINE START

Use normal procedures.

BEFORE TAXIING

1. Present position - ENTER
2. Communications and navigation equipment - CHECK
3. Radar - OPERATE
4. Altimeters - SET AND CHECK
5. CAS - RESET
6. Flight controls - CHECK FREE
7. Flaps - CHECK DOWN
8. IFF - AS REQUIRED
9. T/O trim - CHECK
   If the aircraft is manually trimmed nose down from takeoff trim, nosewheel lift-off speed may be increased.
10. Standby attitude indicator - CAGE
11. Canopy - CLOSED AND LOCKED
    The canopy may bounce slightly as it lowers on canopy sill.

CAUTION

Ensure canopy has completed movement and wait 10 seconds before moving handle to LOCKED position. If there is heavy load when attempting to place the handle in LOCKED, recycle handle to DN and again perform locking procedure. Ensure canopy unlock light is on with handle DN and goes out with handle LOCKED. Ensure the handle is full forward.

12. Pitot heat - ON
13. Warning, caution, BIT lights, and circuit breakers - CHECK
14. Personal equipment and harness - CHECK
15. Weapons - CHECK
16. INS mode switch - INS (FLASHING ALN)

BEFORE TAKEOFF

1. Ejection controls safety lever - ARMED

QUICK TURN

1. After landing checks - COMPLETE
2. Communication with groundcrew - ESTABLISH (if required)
3. Engine shutdown - COMPLETE (if required)
4. Aircraft setup - COMPLETE (if required)

F-15B/D REAR COCKPIT PROCEDURES

BEFORE ENTERING COCKPIT

Refer to foldout section for ejection seat illustration.

1. Ejection controls safety lever - LOCKED
2. Safety pins - REMOVED
   a. Canopy jettison handle pin
   b. Ejection seat safety pins (2)
   c. Canopy actuated initiator pin
3. Auto/manual seat kit deployment selector - AUTO
4. Radio beacon auto/manual selector - AS DESIRED
5. Restraint emergency release handle - FULLY DOWN

INTERIOR CHECK

1. Interior check - COMPLETE
   a. Harness and personal equipment leads - FASTEN

      Attach parachute risers to harness buckles. Attach survival kit and ensure straps are slack. Secure and firmly adjust lap belt. Connect oxygen, G suit and communication leads. Check operation of shoulder harness locking mechanism.

WARNING

After connecting the parachute risers to the harness, lift the locking lever on each koch fitting and verify the actuating lever is full up and snug against the inner part of the locking lever. If the actuating lever will not seat properly, disconnect the release and use a different harness.

   b. Integrated communications control - AS REQUIRED
   c. Canopy jettison handle - FORWARD
   d. VSD - OFF
   e. Communications controls - ON AND SET
   f. Emergency brake/steer handle - IN
   g. Oxygen system - CHECK AND SET

      Pressure - 55 to 120 psi
      Regulator - CHECK

      (1) Oxygen supply lever - FULLY ON

         It is possible for the oxygen supply lever to stop in an intermediate position between OFF and ON. Assure the lever is all the way ON.

      (2) Emergency lever - NORMAL
      (3) Mask - ON

         Breath normally for 3 cycles and check flow indicator operation. Hold breath, all flow should stop and the indicator should show no flow (black). A white indicator indicates a leak which must be corrected before flight.

Indicator - CHECK
  (1) Diluter lever - 100%
  (2) Emergency lever - EMERGENCY
  (3) Oxygen flow - CHECK

Connections - CHECK

Emergency oxygen - CHECKED
  (1) Pressure - CHECK
  (2) Actuating ring - STOWED and CHECKED

h. Circuit breakers - IN

i. Interior lights - AS REQUIRED

2. Arresting hook switch - UP
3. Emergency landing gear handle - IN
4. Command selector valve - NORM (Vertical)

BEFORE TAXIING

1. Oxygen - CHECK QUANTITY
2. Avionics - AS REQUIRED (ILS/TACAN, VSD)
3. Altimeter - SET
4. Anti - G suit - CHECK OPERATION
5. Ejection controls safety lever - ARMED

BEFORE TAKEOFF

1. Harness - CHECK
   Insure all buckles, straps, and fittings are secure and tight.
2. Ejection controls safety lever - CHECK ARMED
3. Command selector valve - AS BRIEFED
4. Warning and caution lights - CHECK OUT

AFTER LANDING

1. Ejection controls safety lever - LOCKED
2. Command selector valve - NORM (vertical)
3. Avionics - OFF
4. UHF 2 mode selector switch - MAN (Some aircraft)

SECTION III

EMERGENCY PROCEDURES AND ABNORMAL OPERATION

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This section covers the operation of the aircraft during emergency/abnormal conditions. It includes a discussion of problem indications and corrective actions as well as procedural steps when applicable. Adherence to these guidelines will insure maximum safety for the pilot and/or aircraft. The situations covered are representative of the most probable malfunctions. However, multiple emergencies, weather or other factors, may require modification of the recommended procedures. Accomplish only those steps required to correct or manage the problem. When dealing with emergency/abnormal conditions, it is essential that you determine the most correct course of action using sound judgment, common sense and a full understanding of the applicable system(s). When practical, advise other concerned agencies (i.e., flight lead, tower, etc.) of the problem and intended course of action. The following rules are basic to all emergency/abnormal conditions. You should thoroughly understand and apply them.

1. MAINTAIN AIRCRAFT CONTROL.
2. ANALYZE THE SITUATION AND TAKE THE PROPER ACTION
3. LAND AS SOON AS PRACTICABLE

During any inflight emergency, when structural damage or any other failure is known or suspected that may adversely affect aircraft handling characteristics, perform a Controllability Check.

Retain the canopy during all emergencies that could result in crash or fire such as crash landing, aborted takeoff, or arresting gear engagement. The protection the canopy affords you during such emergencies far outweighs the isolated risk of entrapment due to canopy malfunction or overturn. During ground egress, consider normal canopy opening procedures first to preclude the possibility of a static seat ejection.

STARTING

AMAD FIRE/OVERHEAT DURING START

AMAD fire/overheat may be recognized by illumination of the AMAD fire/overheat light or by ground crew notification. Extinguisher actuation will discharge the fire extinguisher into the AMAD compartment and automatically shut down the JFS. If this action does not suffice, ground fire extinguishers may be required. If fire light (steady light) or overheat light (flashing light) is on:

1. AMAD light - PUSH
2. Fire extinguisher - DISCHARGE
3. Throttles - OFF

JFS READY LIGHT DOES NOT COME ON

If the JFS ready light does not come on within 10 seconds, and -

a. The JFS sounds normal.
b. The AMAD fire light tests normally.

then the JFS light is inoperative, and the start may be continued (The JFS READY light is required to monitor inflight JFS air start).

If the above cues are not present or JFS did not start on the first accumulator:

a. JFS switch - CYCLE
b. Have ground crew check JFS system.

If no abnormality is found and 30 seconds has elapsed, another JFS start may be attempted.

JFS FAILS TO ENGAGE OR ABNORMAL ENGAGEMENT/ DISENGAGEMENT

Failure to engage is indicated by no decrease in JFS whine after the fingerlift is raised. This may be caused by the throttle not being full off, dirty switch contacts, master switch not on, an electrical malfunction, or low CGB servicing. If the normal starting sequence has been interrupted (one engine shut down for some reason), it may be necessary to cycle the engine master switch to reset the control circuits. Once the JFS has engaged (JFS whine decreased), any abnormal sound or other indication requires immediate JFS shutdown. These can include no JFS whine increase, no engine rotation, rpm hangup, or JFS disengagement. If the JFS fails to decelerate after either engine start, shut down the JFS and both engines. This may indicate AMAD lubrication pump failure.

If JFS fails to engage -

1. Throttle - ENSURE FULL OFF
2. Engine master switch - CYCLE
3. Fingerlift - RAISE AND RELEASE

If still no engagement -

4. Engine master switch - OFF
5. Do not attempt another start

If engagement/disengagement is abnormal -

1. Throttle - OFF
2. Engine master switch - OFF
3. JFS switch - OFF
4. Do not attempt another start

EMERGENCY GENERATOR NOT ON LINE ON START

On internal power starts, the emergency generator should come on line within 30 seconds after raising fingerlift for first engine start. This is indicated by tachometer operation. The emergency generator does not power the emergency boost pump during first engine start; therefore, the EMER BST ON light will not illuminate until the first main generator comes on line. Before TO 1F-15-764, the emergency generator should remain on line until both main generators are on line. After TO 1F-15-764, the emergency generator should remain on the line for 30 seconds after the first main generator is on line. There is a remote possibility of the emergency generator dropping off line prematurely. If this occurs before a main generator comes on line, the tachometer and FTIT gages will fail and will tend to remain at their last valid reading. The engine start fuel flow will go rich. The only indication of this occurrence is a sudden stoppage of rpm and FTIT movement which may, initially, be interpreted as a hung start. Before TO 1F-15-764, regard illumination of the BST SYS MAL light before the second main generator comes on line as an indication that the emergency generator has dropped off line prematurely. After TO 1F-15-764, regard illumination of the BST SYS MAL light less than 30 seconds after the first main generator comes on line as an indication that the emergency generator has dropped off line prematurely.

If emergency generator not on line 30 seconds after raising fingerlift -

1. Emergency generator switch - CYCLE THRU ISOLATE

If emergency generator still does not come on line -

2. Engine master switches - OFF
3. JFS - OFF
4. Abort

If emergency generator prematurely drops off line -

1. Throttle(s) - OFF
2. Engine master switch(es) - OFF
   Have maintenance investigate malfunction

ABNORMAL ENGINE START

ENGINE FAILS TO START (PW-100)

If no indication of light-off 30 seconds after throttle advanced to IDLE -

1. Engine start fuel switch - HIGH (5 seconds maximum)

If still no indication of light-off -

2. Throttle - OFF

If another start attempt desired -

3. Engine - WINDMILL FOR 10 SECONDS
4. Throttle - IDLE

If another start attempt not desired -

3. Engine master switch - OFF
4. JFS - OFF

ENGINE FAILS TO START (PW-220)

If no indication of light off 30 seconds after throttle advanced to IDLE -

1. Throttle - OFF

If another start attempt desired -

2. Engine - WINDMILL FOR 10 SECONDS
3. Throttle - IDLE

If another start attempt not desired -

2. Engine master switch - OFF
3. JFS - OFF

ENGINE FAILS TO ACCELERATE NORMALLY (PW-100)

If both rpm and FTIT appear to stop increasing in the 45-55% range, the engine start fuel switch may be held in the HIGH position for 5 seconds maximum. If the engine continues a normal acceleration, the start may be continued.

1. Engine start fuel switch - HIGH (5 seconds maximum)

If engine still does not accelerate normally -

2. Throttle - OFF

CAUTION

> Before TO 1F-15-831, exercise caution when shutting down an engine with the JFS running. Release the finger lifts before reaching the cutoff position to prevent immediate JFS reengagement. Above 30% engine rpm, JFS damage will occur.

3. Engine master switch - OFF
4. JFS switch - OFF
5. Complete engine shutdown procedure

ENGINE FAILS TO ACCELERATE NORMALLY (PW-220)

If both rpm and FTIT appear to stop increasing during the start sequence -

1. Throttle - OFF
2. Engine master switch - OFF
3. JFS switch - OFF
4. Complete engine shutdown procedure

AUTO-ACCELERATION ABOVE IDLE

If auto-acceleration occurs, place the throttle OFF, press the ENG FIRE PUSH light and place the engine master switch OFF.

HOT START

If one of the following conditions occur during engine start, the starting FTIT limit of 680°C may be exceeded:

- Rpm acceleration simultaneous with or after initial FTIT movement.
- FTIT above 500°C with rpm below 40%
- FTIT rises rapidly thru 580°C
- Rpm stops increasing then decreases while FTIT is stable or increases.

If starting FTIT is exceeded, allowing the engine to windmill after shutdown will assist cooling.

1. Throttle OFF

If FTIT starting limit not exceeded -

2. Engine - WINDMILL (Until FTIT below 200°C).
   The JFS can be engaged when rpm is below 30%.
3. Air source knob - SELECT ENGINE TO BE STARTED
4. Throttle - IDLE
5. Air source knob - BOTH (idle rpm)

If FTIT exceeded starting limit -

2. Engine - WINDMILL (if practical)
3. Engine master switch - OFF
4. JFS switch - OFF
5. Complete engine shutdown procedure.

ENGINE FIRE/OVERHEAT DURING START

1. Fire warning light - PUSH

If warning light remains on -

2. Throttle - OFF
3. Fire extinguisher - DISCHARGE
4. JFS switch - OFF

GROUND OPERATION

ECS LIGHT ON

Illumination of the ECS light during ground operation can be caused by low avionics cooling airflow at idle rpm. Ensure that cockpit temperature control switch is not off and air source knob is at BOTH. Increasing rpm a few percent on either or both engines will usually restore adequate airflow and extinguish the light. If the light remains on, the ECS is not operating normally and avionics equipment may suffer heat damage. Turning off all avionics equipment except the UHF will protect this equipment. Turning and pulling the emergency vent control handle will divert all ECS cooling air to the avionics.

On the ground and after the above actions are completed; if the ECS light is still on, shut down one engine and place its engine master switch OFF to activate automatic avionics shutdown. Confirm automatic avionics shutdown by presence of primary airspeed, altimeter, and vertical velocity OFF flags. All engine instruments, warning/caution lights and fire protection systems remain normal. If the automatic avionics shutdown does not occur, avoid continued operation with the ECS light on.

1. Engine rpm - INCREASE

If light remains on -

2. Avionics (except UHF) - OFF
3. Emergency vent handle - TURN AND PULL
4. Either throttle - OFF
5. Corresponding engine master switch - OFF
   Confirm automatic avionics shutdown by presence of primary airspeed, altitude, and vertical velocity OFF flags.

If automatic avionics shutdown does not occur -

6. Remaining engine - SHUTDOWN (as soon as practical)

INS PROBLEMS

ALN LIGHT NOT ON OR NOT FLASHING

If the ALN light does not illuminate within approximately three minutes, check that the ADI is erect (INS selected on the ADI mode switch), present position has been entered and is displayed, and the ALN light tests good. If the ADI has not started to erect, the align cycle did not initialize. If the INS is shut down before the ADI sphere erects (INS selected on the ADI), leave the switch off for 5 minutes to prevent damage to the gyros. If the INS is shut down after ADI sphere erection (INS selected), leave the switch off for 15 seconds before initiating another alignment. Do not switch to GC or STOR after switching to a NAV mode as this degrades the alignment.

If the ALN light does not flash within 10 minutes (3 minutes for STOR) under normal temperature conditions (−20°C, (−4°F) or above), switch to INS, and monitor groundspeed and present position or any update error for indication of satisfactory alignment. This condition can be caused by wind induced motion during alignment. Cold temperature can extend the normal GC alignment time to as much as 14 minutes.

DATA WILL NOT ENTER

If the CC/INS will not accept data, depress the CLR pushbutton and again enter using firm pressure for at least 1/2 second on the ENTR pushbutton. Resetting the CC may clear the problem.

EXCESSIVE GROUNDSPEED/POSITION ERROR

If groundspeed and present position/update errors are excessive prior to take-off, another alignment may be attempted. Generally, groundspeed error of 6 knots or more, and/or positional error of 2 miles or more, are considered excessive for normal operations. Lesser errors may be considered excessive for certain missions. If time does not allow full GC alignment, a BATH may be acceptable if a suitable magnetic variation is known. In any case, the INS should be off for at least 15 seconds prior to another alignment, and the aircraft must not be moved during the alignment period. If possible, monitor the ground speed and present position for at least one minute to assess accuracy. If another alignment is impractical, use the A/D or TCN mode.

AIRCRAFT MOVEMENT WHILE IN ALIGN MODE

If the aircraft is moved while the INS is in an align mode, the alignment will probably be invalid, and internal parameters may be changed enough to require maintenance. If the system had not entered its bias period (less than approximately 8 minutes after selecting GC), another complete GC alignment will probably be adequate. If the aircraft has been moved only straight ahead (no turns), selecting INS may give sufficient accuracy for most missions. If the INS is in its bias cycle, any movement of the aircraft will probably change the biases to the point that maintenance is required. Immediately selecting INS will terminate the alignment and bias actions, and will minimize errors. The decision as to what action to take depends on the magnitude of errors, time available, and need for an accurate INS. Possibilities include another GC alignment, acceptance of current alignment, use of air data or tacan mode, or abort. If decision is made to use the INS (with or without realignment), check ground speed and present position prior to takeoff.

a. Mode selector knob - INS
b. Monitor ground speed/present position.

LOSS OF BRAKES

Loss of normal brakes may be caused by a defective anti-skid system, faulty brakes, or UTL A hydraulic pressure loss. Malfunction of the anti-skid system may not illuminate the anti-skid light, however, failures may be recognized by no apparent braking action. In any case, it is important to remember when assessing the status of brakes, that very little deceleration will be sensed by the pilot at speeds above 100 knots regardless of whether the anti-skid system has failed. Therefore, aerodynamic braking should be accomplished first during the landing roll, followed by braking action as required. If loss of brakes is determined, turn the anti-skid switch to OFF (PULSER if required). If braking is not restored, pulling the emergency brake/steering handle provides an alternate power source for brakes/steering and bypasses the anti-skid/pulser system. Sufficient accumulator pressure is available to safely stop the aircraft. Repeated brake applications deplete the system faster than a smooth steady application. If UTL B is operating, the JFS accumulator will remain charged. If the JFS LOW light is on, the emergency brake system is not reliable for taxi since accumulator pressure can no longer be monitored. Do not pull the emergency brake/steering handle in flight as the nosewheel will follow rudder commands, and touchdown protection is lost. If UTL A is available normal operation can be restored by pushing in the emergency brake/steering handle and releasing the paddle switch. When brake failure occurs during landing roll, consider lowering the tail hook before attempting to restore braking. While taxiing, if stopping distance is critical, use the emergency brake/steering handle first.

If loss of brakes occurs -

1. Brakes - RELEASE
2. Anti-skid switch - OFF/PULSER (if required)
3. Brakes - REAPPLY
   To avoid blowing tires, light brake pedal pressure should be applied initially to develop a feel for effective braking. On pulser equipped aircraft, place the anti-skid switch to OFF at taxi speed.

If braking is not restored -

4. Brakes - RELEASE
   Completely remove both feet from brake pedals.
5. Emergency brake/steering handle - PULL
   Pulling the emergency brake above 70 knots increases the possibility of blown tires.
6. Paddle switch - HOLD PRESSED
   Holding the paddle switch pressed will ensure that the nose gear steering/brakes shift to the JFS accumulator pressure.
7. Brakes - REAPPLY
   To avoid blowing tires, light brake pedal pressure should be applied initially to develop a feel for effective braking.

LOSS OF DIRECTIONAL CONTROL

Directional control problems with the nose gear on the ground may be caused by a blown tire, nose gear shimmy, defective nose gear steering, defective anti-skid, overextended strut, or a faulty brake. For a known blown tire or brake loss refer to the appropriate emergency procedure. If the cause of the directional control problem cannot be determined, time spent in fault isolation may worsen the situation. In this case, a single procedure (pulling the emergency brake/steering handle) is recommended. Use of this procedure, provides an alternate source for powered braking/steering and disables the anti-skid and pulser system(s), thereby accomodating all of the various failure modes which may have caused the directional control problem.

1. Brakes - RELEASE
2. Emergency brake/steer handle - PULL
   Because the anti-skid has been removed, be prepared for a possible wheel lockup and a subsequent blown tire(s).
3. Paddle switch - HOLD PRESSED.
   This ensures that the nose gear steering will shift to JFS hydraulic accumulator pressure.

If departing a prepared surface -

4. Throttles - OFF (conditions permitting)

GROUND EGRESS

If time is extremely critical, consider ground ejection. The emergency evacuation procedures are identical to normal egress. Exercise care to avoid catching personal equipment on the canopy rail hooks. If canopy jettison is required, remain in the seat to minimize possibility of injury as the canopy departs. The boarding ladder may be extended by foot pressure on a button inside the upper foot well. Although other egress means are available, depending on the urgency and critical nature of the situation, egress via the boarding ladder is the safest method. The fastest egress is made by hanging from the canopy rail and dropping. Egress by this method may result in injury.

1. Ejection controls safety handle - LOCKED
2. Shoulder harness - RELEASE
3. Lap belt - RELEASE
4. Survival kit straps - RELEASE
5. Canopy - OPEN

WARNING

The canopy may not depart the aircraft if it is jettisoned with the canopy unlocked.

If manual canopy operation is required -

a. Canopy control handle - UP
b. (F-15A/C) Internal canopy manual uplock handle - REMOVE PIN AND ACTUATE
c. Canopy - PUSH

TAKEOFF

ABORT

The decision to abort or continue takeoff depends on many factors, most of which relate to a specific takeoff situation. Considerations should include, but are not limited to, the following:

a. Runway factors: Runway remaining, surface condition (wet, dry, etc.), type and/or number of arresting gear available, obstructions alongside or at the departure end, wind direction and velocity, weather and visibility.
b. Aircraft factors: Weight, stores aboard, nature of the emergency, velocity at

decision point, and importance of getting airborne.

c. Stopping factors: Maximum braking (see Minimum Run Landing, section II), speed brake, hook, jettisoning stores, engine shutdown.

Consider aborting after airborne where sufficient runway is available. Normally, with the short takeoff distances of the aircraft, abort is not a problem, but early decision will provide the most favorable circumstances.

1. Throttles - IDLE
2. Brakes - APPLY

   If aborting with a blown main tire or if a main tire blows during abort, place the anti-skid switch OFF/PULSER (if equipped) and use light braking on the good tire.

WARNING

After an abort where unusual braking is required, do not shut down engines until adequate fire fighting equipment is available. Hot wheels and brakes can provide an ignition source for fuel drained overboard during engine shutdown.

3. Hook - AS REQUIRED

EXTERNAL STORES JETTISON

Two means exist to jettison external stores: The emergency jettison button, on the center instrument panel, and the select jettison button, on the armament control panel.

WARNING

The emergency jettison button simultaneously jettisons all pylons and AIM-7 missiles. When airborne, the possibility exists of an AIM-7-pylon-store collision, with subsequent missile/store collision with the aircraft. With no AIM-7's aboard, store-to-store collision is still possible, but the probability of aircraft involvement is minimal. Ground jettisoning may result in the store/pylon striking the ground before the pylon aft pivots release. Under these conditions, the wing mounted pylon stores will probably rotate horizontally, and will strike the landing gear if the rotation is in that direction. The centerline pylon will almost certainly strike the landing gear.

Do not use emergency jettison on the ground, or with AIM-7 missiles aboard, except as a last resort or in extreme emergency. For complete selective jettison procedures, refer to TO 1F-15A-34-1-1 or TO 1F-15C-34-1-1.

ENGINE FAILURE ON TAKEOFF

Depending on the type of failure and aircraft conditions, MIL power should be sufficient to sustain flight. The aircraft accelerates better at a reduced pitch attitude. If afterburner is required, use only that necessary to maintain safe flight.

If takeoff is continued -

1. Throttle(s) - AS REQUIRED
2. Climb to a safe altitude and investigate.

AFTERBURNER FAILURE

PW-100

The two most common malfunctions are afterburner induced fan stall and afterburner blowout/failure to light. Fan stall results from afterburner induced airflow disturbance and is characterized by an audible bang. Although usually associated with afterburner selection or cancellation, fan stall can result from a throttle transient anywhere within the afterburner range, particularly in the high altitude slow speed regime. Fan stalls are normally self-clearing, but engine parameters at MIL and above will be low until the EEC can retrim. Afterburner blowout can occur at any afterburner setting, and is usually associated with high altitude slow speed operation. Blowout is detected by thrust loss followed by nozzle closure. If either a fan stall or afterburner blowout occurs, reduce throttle to MIL or below to terminate afterburner fuel flow. This prevents auto-ignition and resets the afterburner ignition timer. Allow the engine to stabilize at MIL before attempting a relight.

PW-220

The F100-PW-220 engine has an automatic afterburner recycle capability using the light-off detector. If the afterburner does not light satisfactorily or a blowout occurs, the DEEC will automatically resequence the afterburner ignition system a maximum of three times in approximately 12 seconds providing the throttle remains above MIL. If the afterburner does not light during these attempts, the throttle must be retarded to MIL or below before further attempting to light the afterburner.

If the ENG CONTR caution light is on, afterburner operation may be prevented or may be limited to only the first and second segment. The ENG CONTR switch may be cycled ON-OFF-ON at MIL or below. If the ENG CONTR caution light goes off, the engine will operate normally. However, if there is a malfunction in the afterburner control, the ENG CONTR caution light may come on again when afterburner is reselected.

ENGINE FIRE/OVERHEAT ON TAKEOFF

If you decide to abort -

1. Fire warning light - PUSH

If warning light remains on -

2. Throttle - OFF
3. Fire extinguisher - DISCHARGE

If you decide to continue -

1. Climb to safe altitude and follow Engine Fire/Overheat Inflight procudures.

PITCH RATIO FAILURE

If takeoff is made with the CAS ON, it is unlikely that pitch ratio failure will cause any control difficulty, and takeoff may be continued. The PITCH RATIO light may be the only noticeable indication of failure. However, if the failure occurs with CAS OFF, longitudinal stick forces may be considerably higher than normal, and late nosewheel liftoff will likely result. In this case, aborting the takeoff is preferred if conditions permit. If takeoff is continued with CAS OFF, maneuver conservatively since the ARI is inoperative.

TIRE FAILURE DURING TAKEOFF

Tire failure is very difficult to recognize and may not be noticed in the cockpit. If a failure is suspected, or confirmed, and:

If takeoff is continued -

1. Gear - DO NOT RETRACT
2. Follow Blown Tires procedure.

LANDING GEAR FAILS TO RETRACT

If the warning light in the landing gear handle stays on after the handle is placed up or comes on in flight, the gear or gear doors are not correctly sequenced. Reduce airspeed below 250 knots, check landing gear circuit breaker in, and lower the gear. If the gear comes down normally, attempt another retraction. If the light is still illuminated, lower the gear, reduce weight, and land. If the gear will not indicate a normal down and locked condition, see Emergency Gear Lowering Procedure.

INFLIGHT

OUT-OF-CONTROL RECOVERY

The aircraft is out of control when it does not properly respond to flight control inputs. The departure warning tone indicates a high yaw rate and is the best indication of an impending spin. Immediate neutralization of the controls when the warning tone begins will recover the aircraft from all out-of-control situations. Releasing all stick pressure will result in neutral controls if trimmed near 1 g.

An auto-roll is a rudder roll caused by rudder deflections with neutral cockpit controls. The aircraft will slowly self-recover; however, for a rapid recovery from a positive g auto-roll, apply full rudder against the roll. Do not use aileron to stop the roll as a prolonged input against the roll can induce a spin. If unsure of the roll direction, use the ADI to determine roll direction. Do not use the turn needle as it oscillates during rolls. The departure warning tone may not sound.

If the controls are not neutralized when the departure warning tone begins, a spin may develop. Spins are typified by a high rate yaw accompanied by a high rate beeper. The turn needle will be steady and fully deflected. For recovery from a positive g spin, maintain neutral longitudinal stick and apply full lateral stick with the yaw, the same direction as the turn needle. Rudder is not needed but, if used, must be against the yaw, opposite to the direction of the turn needle. Neutralize all controls when the departure warning stops and allow large residual motions to damp.

Neutral controls will recover the aircraft from all negative g conditions including spins and auto-rolls; however, rudder with the roll will provide a faster recovery from a negative g auto-roll.

Do not move the throttles unless in afterburner. If in afterburner, reduce power to MIL.

1. Controls - NEUTRAL

If aircraft is not recovering, an auto roll is possible -

2. Rudder - OPPOSITE ROLL

If aircraft is still not recovering, an upright spin is most probable -

3. Longitudinal stick - CENTERED
4. Lateral Stick - FULL IN DIRECTION OF YAW (turn needle)
5. Aircraft recovers (tone ceases) - CONTROLS NEUTRAL

If recovery is not apparent by 10,000 feet AGL -

6. Eject.

EJECTION

Ejection can be accomplished at ground level between zero and 600 knots airspeed with wings level and no sink rate. Appreciable forces are exerted on the body when ejection is performed at airspeeds above 450 knots. Above 600 knots, ejection is extremely hazardous due to excessive wind blast forces. The seat will not fire unless the canopy has separated. Ground ejection cannot be accomplished unless the canopy is down and locked or has been jettisoned previously. Basic procedures are shown in figure 3-7. Minimum ejection altitudes for various flight conditions and attitudes are shown in the ejection seat performance charts in the foldout section.

1. Ejection handle(s) - PULL

ENGINE STALL/STAGNATION

Engine stalls are the result of a disruption of airflow across one or more fan/compressor blades. Although many conditions affect compressor airflow (i.e., aircraft maneuvering, ice, EEC/DEEC, afterburner backpressure, etc.) most will not exceed the designed stall margin of the engine. However, the fan bypass duct provides a convenient passage for pressure disturbances created in the afterburner section to travel directly forward to the fan/compressor. If the engine nozzle does not position properly when operating the afterburner, pressure pulses can be transmitted forward to the fan/compressor causing the blade to exceed the stall limit. Hence, most stalls will be associated with use of the afterburner. High altitude/slow flight and maneuvering all increase the sensitivity to stall because they increase airflow disturbances to the face of the engine. If the fan/compressor stall does not self-clear, the disturbed airflow will propagate through the compressor, resulting in a stagnation. Unstable burning then occurs in the combustion chamber causing higher than normal temperatures and rpm decreasing to sub-idle (less than 60%). To clear this condition, the engine must be shutdown and restarted. Stalls normally produce an audible pop, bang, or thud, but may occur without audible warning. Engine instruments may not indicate anything unusual, but rpm rollback, increased FTIT and nozzle opening may be noted for more severe stalls at MIL and above. Generally, the stall will be self-clearing; however, quickly retarding the throttle to MIL (IDLE if non-afterburner stall) will aid recovery. If a stagnation developes, it will be characterized by rising FTIT and decreasing rpm with no change in throttle position. FTIT may exceed 1000°C or stabilize at some lower level. FTIT above 1000°C will result in engine damage. To prevent catastrophic engine damage, immediate corrective action should be taken. It is possible that a stagnated engine may also display a fire plume trailing the aircraft if the throttle is not placed to OFF. This plume may persist until the throttle is placed to OFF and the stagnation cleared. A GEN OUT light and the EMER BST ON light may be the first indication of engine stagnation. With a single engine stagnation and no other anomaly, the generator light and the emergency boost light should be the only caution light(s) on before engine shutdown. Post stagnation engine operation is keyed to FTIT. If 1000°C was not exceeded, normal engine operating limits apply. If 1000° was exceeded, the engine may be started to provide redundant hydraulic and electric power, but should be left at IDLE unless additional thrust is required to ensure safe recovery. After a stagnation has cleared, engine parameters at MIL will initially be lower until EEC/DEEC can retrim.

SINGLE ENGINE STALL/STAGNATION

1. Throttle - CHOP TO IDLE (MIL if in AB)
   If afterburner stall does not clear at MIL, chop the throttle to IDLE.

If FTIT continues to rise -

2. Throttle - OFF
3. Perform restart.

If FTIT exceeded 1000° -

4. Throttle - LEAVE AT IDLE (if practical)

SINGLE ENGINE OPERATION

If the engine will not start, best cruise may be approximated by a climb at 250 knots until rate of climb stops. Accelerate to 0.7 Mach in MIL. Cruise climb as fuel weight decreases.

DOUBLE ENGINE STALL/STAGNATION/ FAILURE

Three conditions can cause double engine flameout: all boost pumps inoperative, empty feed tanks or mechanical falure of both engines. If both main boost pumps and the emergency boost pump are not operating, restart is possible only within a severely restricted flight envelope. If altitude permits, immediately lower the nose to maintain 350 knots. Check rpm and FTIT to determine whether the engines are flamed out or stagnated. If the flameouts were caused by temporary fuel starvation, they may restart. If the engines are stagnated, they must be shut down and restarted. Shut down the right engine first (less hydraulic load) unless FTIT exceeds 1000°C. If FTIT exceeds 1000°C, shut down the engine with the lower FTIT.

During a double engine out situation, regardless of airspeed, altitude or cause, attempt a spooldown restart; however, the primary task is to maintain enough hydraulic power for aircraft control while getting at least one engine producing normal power. A single engine at about 18% or both engines at 12%, will provide enough hydraulic power for flight control and emergency generator operation. An airspeed of 350 knots will normally maintain 12% rpm or greater. At low speed, a momentary steep dive may be required to rapidly attain 350 knots; however, a shallow dive (10° or less) will maintain 350 knots and 12% rpm. Once steady state rpm is established, excessive airspeed/dive angle reduces time available for restart. If sufficient rpm is not maintained to fully power the emergency generator system, the emergency generator output may degrade to powering only the ISOLATE functions. In this case, engine instruments (except RPM on aircraft 83-0035 and up) will fail at their last valid reading. If this occurs, increase airspeed to increase engine rpm and cycle the emergency generator switch to ISOLATE and back to MAN to restore full emergency generator power. The JFS, when engaged, will provide sufficient hydraulic power for flight control and emergency generator operation permitting a minimum rate of descent glide at 210 knots.

During a double engine stagnation, allow one engine to remain in stagnation while commencing a restart on the other engine. Prolonged operation of the stagnated engine increases damage and reduces the probability of successful restart of that engine; therefore, shut down the stagnated engine and commence a restart as soon as a restart is indicated on the first engine.

Eject before losing flight control. Imminent loss of control is indicated by loss of the emergency generator and/or control transients as the first PC system drops to 0.

DOUBLE ENGINE STALL/STAGNATION

1. Both throttles - CHOP TO IDLE (MIL if in AB)
   If afterburner stall does not clear at MIL, chop throttle(s) to IDLE.

If FTIT on both engines continues to rise -

2. Throttle (right engine) - OFF WHILE ESTABLISHING 350 KNOTS
   If FTIT exceeds 1000°C, shut down engine with lower FTIT.
3. Perform Restart procedure
   If optimum restart parameters are not met by the time rpm decreases through 25% for PW-100 or 30% for PW-220, place the throttle to midrange regardless of FTIT, airspeed or altitude.
4. At rpm increase on engine being started or if restart unsuccessful, shut down other engine.
5. Other engine - RESTART

If above restart attempts fail -

6. JFS assisted restart - PERFORM (if conditions permit).

RESTART

Ignition and fuel are continuously supplied when the throttles are at IDLE or above. If an engine does flameout and auto start does not occur, it is unlikely that a start can be accomplished as cycling the throttles through OFF does not recycle either ignition circuits or fuel flow. Therefore, restarts are generally required only because an engine has been shut down for some reason. Restarts may be made with rpm as low as 12% (fuel flow and/or ignition may not be available below approximately 12%); however, for optimum restart capability, place the throttle in midrange when the following conditions are met:

PW-100

a. RPM between 25% and 40%.
b. FTIT below 700°C.

PW-220

a. RPM between 30% and 50%.
b. FTIT below 800°C.

Normally the fastest restart is accomplished by placing the throttle to midrange as rpm unwinds (spooldown restart) rather than waiting for rpm to stabilize (windmill restart), or attempting a JFS assisted restart. Advancing the throttle at a minimum of 25% (PW-100) or 30% (PW-220) when rpm is decreasing should allow time for a relight before rpm drops to 12%. There is a high probability of hot starts below 250 knots (PW-100 and PW-220 primary mode) or 275 knots (PW-220 secondary mode). If airspeed is below 350 knots, accelerating toward this speed during the restart attempt, by diving and/or use of the good engine, will enhance the chances for a good restart, particularly at very high altitude. If airspeed is insufficient and rpm drops below

12%, airspeeds up to 450 knots may be required to regain 12%.

Restart indications are practically the same as during ground start. Initially, both rpm and FTIT increase. FTIT may reverse several times, but rpm should continue to increase. At approximately 55%, rpm accelerates rapidly. Unsuccessful restart is indicated by a reversal in rpm trend (rpm begins to decrease), or by FTIT increasing through 800°C with rpm hung or decreasing.

For the PW-100 engine, if either of these indications occur, place the throttle OFF, increase airspeed 20-30 knots, wait for 700°C FTIT, and attempt another restart. If a hot start is experienced, hold the engine start fuel flow switch to LOW during the next start attempt. If there are no restart indications within about 15 seconds after advancing the throttle, or if both rpm and FTIT appear to stop increasing, increasing airspeed and holding the engine start fuel flow switch to HIGH may cause the engine to accelerate.

For the PW-220 engine, if either of these conditions occur and a start with the ENG CONTR switch is unsuccessful, consider a SEC start. If the control system senses a condition which could prevent safe operation in the primary mode, an automatic transfer to SEC will occur and a SEC start will result regardless of the ENG CONTR switch position. The start procedure for either a primary or secondary start is the same; however, a higher airspeed is required for SEC start. Restart time for a SEC start will range from about 30 seconds at sea level to 60 seconds above 30,000 feet.

JFS ASSISTED RESTART

JFS airstart capability has been incorporated for assistance in engine restarting. This capability is intended for use when encountering engine stall/stagnations after all other restart options have been attempted or rejected as being impractical. The probability of a successful JFS airstart and engine engagement will be enhanced if the aircraft is within the envelope depicted in figure 3-1. Additionally, centerline stores and/or pylon should be jettisoned if at all possible. If the centerline stores and/or pylon will not jettison, it may be necessary to descend to lower altitudes to achieve a JFS airstart. In all cases, proper consideration to the safe ejection envelope should be made prior to attempting the JFS airstart procedure. During restart attempts, ensure that at least one engine is rotating (even in stagnation) at or above 18% rpm to provide sufficient hydraulic power for the emergency generator and flight controls. If a JFS assisted restart is desired:

1. Throttle - OFF
2. Centerline stores and/or pylon - JETTISON (if required)
   If both engines are below minimum rpm for generators (approximately 45%) or both main generators are inoperative, the centerline stores and pylon can only be jettisoned by pressing the emergency jettison button. The ECM pod is not jettisonable and, when on the centerline station, will significantly reduce the JFS start envelope.
3. JFS switch - CHECK ON

After at least one engine is below 45% rpm -

4. JFS handle - PULL AND RELEASE
   Use single accumulator for inflight JFS starts. If both accumulators are discharged simultaneously the JFS may accelerate too rapidly and fail to start.
5. JFS ready light - CHECK ON (within 10 seconds)

After engine rpm is below 30% -

6. Finger lift - RAISE AND RELEASE
   Attempts to engage the JFS above 30% rpm may shear the CGB shaft. Once the JFS is engaged, sufficient hydraulic pressure to the flight controls should be available to permit a controlled minimum rate of descent glide (approximately 210 knots).
7. Throttle - MID RANGE (after engine reaches steady state motoring speed of 26 to 29% rpm)

CAUTION

Exercise caution when shutting down an engine with the JFS running. Release the finger lift before reaching the cutoff position to prevent immediate JFS reengagement above 30% engine rpm.

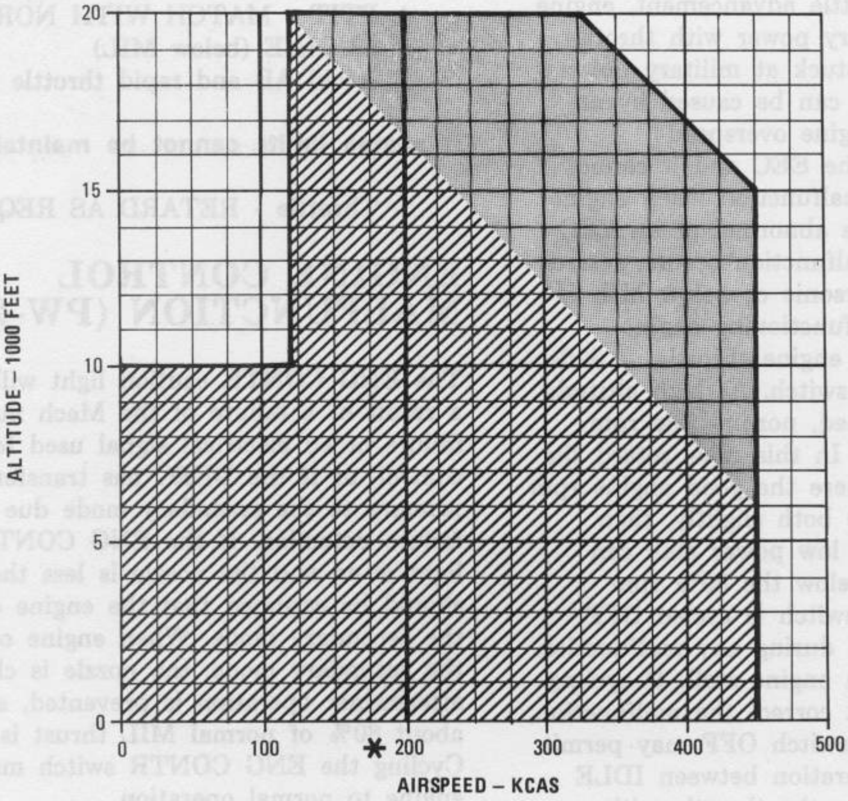
8. Other engine - START (if applicable)
9. JFS - CONFIRM OFF

INLET LIGHT ON

With the inlet ramp switch in AUTO, the light indicates either an AIC failure, ramp position error, or a diffuser ramp that did not lock or unlock at the appropriate Mach number. If either INLET light comes on with the inlet switch in AUTO, place the switch to EMERG.

With the INLET light on or the ramp switch in EMERG, reduce speed below Mach 1.0. Accelerations are limited to ±4.0 to −1.0G above Mach 0.95. Do not reduce throttle below MIL above Mach 1.0. An air inlet controller failure may affect the EEC (PW-100), ENG CONTR (PW-220), roll ratio, and rudder limiter.

INFLIGHT JFS STARTING ENVELOPE



LEGEND

▩ CLEAN CENTERLINE ONLY.

▨ CLEAN CENTERLINE OR CENTERLINE PYLON INSTALLED (WITH OR WITHOUT STORES).

✱ DUE TO POSSIBLE MAIN ENGINE HOT START, JFS ASSISTED ENGINE START NOT RECOMMENDED BELOW 200 KNOTS.

15A–1–(131)B

Figure 3-1

ENGINE ELECTRONIC CONTROL MALFUNCTION (PW-100)

Fluctuation of rpm, FTIT, and nozzle position accompanied by thrust surges can be caused by a malfunction of the engine electronic control (EEC). High FTIT and engine overspeed with throttle advancement, engine rpm rollback from military power with throttle advancement, engine rpm rollback from military power with throttle at MIL, or engine rpm stuck at military power with throttle below MIL can be caused by an EEC malfunction. An engine overspeed automatically shuts off the EEC and it cannot be reset. Suspect EEC malfunction when engine operation or rpm appears abnormal or an EEC light illuminates. If a malfunction occurs, retard throttles to MIL if supersonic or below MIL if subsonic. Match the malfunctioning engine throttle with the normal engine throttle at 80% rpm and cycle the EEC switch. At high altitude with low indicated airspeed, normal idle rpm may be more than 80%. In this case, retard the throttles to the point where the good engine rpm stops decreasing, advance both slightly, then cycle the EEC switch. A low power stall can occur if the throttle is below the 80% rpm position when the EEC switch is cycled OFF. Rapid throttle movement during any malfunction of the EEC can result in engine stall. If cycling the EEC switch does not correct the malfunction, operating with the EEC switch OFF may permit nearly normal engine operation between IDLE and MIL. Do not advance the throttle with an EEC light illuminated and the EEC switch ON. Normally, with the EEC switch OFF, match FTIT with the normal engine FTIT. If necessary, the throttle may be further advanced if rpm and FTIT limits are observed. Rapid throttle movement or afterburner selection can cause engine stall. If rpm does not follow throttle movement and the Engine Electronic Control Malfunction procedure does not clear the problem, check other engine instruments to ensure that the engine is not stagnated. Failure of the rpm to follow throttle movement may be caused by various failures. If all other engine instruments are within normal limits, do not shut down the engine unless excess thrust is a problem. Restart may be impossible if the engine is shut down under this condition.

1. Throttles - RETARD (MIL if supersonic)
   Inflight - MATCH WITH NORMAL ENGINE THROTTLE AT 80% OR SLIGHTLY ABOVE MINIMUM RPM
   Ground - IDLE
2. EEC - CYCLE

If malfunction still exists -

3. EEC - OFF
4. FTIT - MATCH WITH NORMAL ENGINE (below MIL)
5. Avoid AB and rapid throttle movement.

If engine limits cannot be maintained -

1. Throttle - RETARD AS REQUIRED

ENGINE CONTROL MALFUNCTION (PW-220)

The ENG CONTR caution light will come on as a result of a failure of the Mach number signal, failure of an electrical signal used for afterburner control, or if the DEEC has transferred from the primary to the secondary mode due to DEEC failure detection. If the ENG CONTR caution light is on and the nozzle is less than 5%, it should be assumed that the engine control is in the secondary mode. When engine control is in the secondary mode, the nozzle is closed, afterburner operation is prevented, and only about 80% of normal MIL thrust is available. Cycling the ENG CONTR switch may return the engine to normal operation.

If supersonic -

1. Throttles - MIL
2. Slow to subsonic

If subsonic -

1. Throttle - 80%-85% RPM
2. ENG CONTR switch - CYCLE ON-OFF-ON
   Successful transfer from primary to secondary control can be accomplished throughout the flight envelope except at MAX power above 40,000 feet and less than 300 knots.

If engine operation abnormal -

3. ENG CONTR switch - OFF

NOZZLE FAILURE

The cockpit nozzle indicator indicates nozzle control unit commands, not actual nozzle position. It is possible for the nozzle to fail open or closed and still have normal cockpit indications. Engine stall when selecting afterburner may be an indication of a nozzle failed closed. A loss of thrust and lower than normal FTIT at MIL may be an indication of a nozzle failed open.

For PW-100 engines, if nozzzle malfunction is indicated, set the throttle at 80% and cycle the EEC switch. This may restore normal operation. If proper nozzle operation cannot be restored or a nozzle malfunction is suspected, place the EEC switch OFF. Maintain rpm below MIL and avoid rapid throttle movement. Do not use MIL or afterburner unless required to maintain flight. Gear down idle thrust will be greater than normal with the nozzle full closed.

For PW-220 engines, if nozzle malfunction is indicated, leave the ENG CONTR switch ON. Do not use MIL or afterburner unless required to maintain flight. Gear down idle thrust will be greater than normal with the nozzle full closed.

ENGINE FIRE/OVERHEAT INFLIGHT

If a fire/overheat light comes on or indications of an engine/aft fuselage fire are observed, perform this procedure. A fire in the afterburner section or in the vicinity of the nozzle will not cause a FIRE light to come on. The only indication of a fire in the vicinity of the afterburner or nozzle may be flames or trailing smoke. If an afterburner/nozzle burn through occurs, reducing the throttle to IDLE should extinguish the fire within 30 seconds. If the initial throttle reduction causes the light to go out or fire indications to cease and the fire detection system tests good, restrict thrust on the affected engine. If a fire/overheat light is accompanied by other indications of a fire (e.g., smoke, control difficulties, bleed air light, hydraulic or electrical anamolies), complete the procedure. Once the light has been pushed and the fuel shut off, do not depress the light again unless engine restart is necessary. If the fire extinguisher is used successfully, do not consider restarting the engine unless absolutely necessary.

1. Throttle - IDLE

If warning light remains on or fire persists -

2. Fire warning light - PUSH
3. Throttle - OFF
4. Fire extinguisher - DISCHARGE

If fire persists -

5. Eject.

If warning light goes off or fire out -

1. Fire warning system - TEST
2. Monitor other fire indications closely.

AMAD FIRE/OVERHEAT INFLIGHT

The most likely cause of an AMAD fire light in flight is the generators. If indications of a fire or overheat exist, check electrical indications as well. Turning off a generator may remedy the situation. If an AMAD fire or overheat light illuminates:

1. Throttles - REDUCE
2. Discontinue mission.

If fire warning (steady) light remains on -

3. AMAD light - PUSH
4. Fire extinguisher - DISCHARGE

If fire warning light still remains on -

5. Emergency generator switch - MANUAL
   The EMER BST ON light should illuminate and the BST SYS MAL light should remain out.
   If the BST SYS MAL light is on when both generator switches are turned OFF, double engine flameout may occur due to lack of boost pump pressure.
6. Both main generator switches - OFF

If fire persists -

7. Eject.

If fire warning light goes out -

1. Fire warning system - TEST
2. Monitor other fire indications closely

SMOKE, FUMES, OR FIRE IN COCKPIT

Consider all unidentified odors in the cockpit as toxic. Do not confuse condensation from the air conditioning system with smoke. The most probable source of visible smoke or fumes in the cockpit is from the engine or residual oil in the ECS ducts which can enter the cockpit through the ECS system via the center pedestal air outlet and/or cabin defog outlets. This smoke is blue grey in color, has a characteristic pungent odor, and may cause the eyes to sting. This odor may be noticed during engine run-up (if accomplished), during takeoff roll and, occasionally, during supersonic flight. Another possible source of smoke or fumes is an electrical malfunction or overheat in equipment located in the cockpit. In the event of electrical short or overload condition, this equipment may generate electrical smoke (usually white or grey in color) but should not cause an open fire since cockpit equipment uses very little electrical current. Cockpit electrical wiring insulation may smolder and create smoke, but will not erupt into a seriously damaging fire. There are no fuel or hydraulic lines passing through or near the cockpit area, hence, the possibility of cockpit fire is remote. Both main generators may be turned off after emergency boost system operation is confirmed.

If smoke or fumes detected -

1. Oxygen - 100%
   If required, the emergency oxygen system will provide a 10 minute supply of oxygen. Disconnect the aircraft oxygen supply hose from the omni-connector when the emergency oxygen is activated.

If required -

2. Emergency vent handle - TURN AND PULL (below 25,000 feet)

If electrical smoke confirmed -

3. Non-essential electrical equipment - OFF
4. Land as soon as practical.

If cockpit visibility restricted -

5. Canopy - JETTISON

WARNING

If the cockpit is the source of the smoke or fumes, canopy jettison may cause an eruption of flames around the pilot.

If electrical fire/smoke persists -

6. Emergency generator switch - MAN
   The EMER BST ON light should illuminate and the BST SYS MAL light should remain out.
   If the BST SYS MAL light is on when both generator switches are turned OFF, double engine flameout may occur due to lack of boost pump pressure.
7. Both main generator switches - OFF

If electrical fire still persists -

8. Emergency generator switch - ISOLATE

If fire is intolerable -

9. Eject.

CANOPY UNLOCKED INFLIGHT/LOSS OF CANOPY

The CANOPY UNLOCKED light indicates that either the canopy locking mechanism has moved to the unlocked position or the canopy actuated initiator lanyard has become disconnected. The following procedures are recommended:

1. Slow to below 250 knots
2. Emergency vent handle - TURN (below 25,000 feet)
3. Canopy control handle - FULL FORWARD

If canopy is lost inflight -

1. Slow to lowest practical airspeed (200 knots maximum for F-15B/D with rear seat occupied).
2. Descend to lowest practical altitude.
3. Land as soon as practical

Canopy loss presents only minor problems in the F-15A/C (F-15B/D if only the front cockpit occupied). Air-to-ground communication may be possible up to about 400 knots, but airspeed should be reduced as much as practical and precautions taken to remain within the cockpit confines to prevent injury from the slipstream. For the F-15B/D severe problems may be encountered by the rear seat occupant. In this case, rapidly slowing below 200 knots and reducing altitude enables intercockpit communication and reduces the wind effects on the rear seat occupant. The rear seat occupant can attain the lowest slipstream profile by lowering the seat full down, grasping the lower instrument panel with the left hand and leaning full forward while using the right hand for helmet/mask retention. If necessary, select COLD MIC to prevent noise interference with pilot's radio.

EXTREME COCKPIT TEMPERATURE

If temperature control cannot be maintained in AUTO, switch to MANUAL and adjust temperature control. If this fails and temperature becomes excessive, pull the emergency vent handle. Observe caution at altitude and consider descent. If temperature hot and altitude low, consider a climb to cooler air and/or deceleration to slower speed.

BLEED AIR MALFUNCTIONS

Bleed air malfunctions have the potential for developing into serious situations. Depending on the location of the hot air leak, various indications can result, causing pilot confusion and misinterpretation. Therefore, prompt action is required by the pilot.

If left or right bleed air light comes on -

1. Air source knob - OPPOSITE SOURCE

If light remains on -

2. Throttle - IDLE

If both lights come on -

1. Air source knob - OFF

ECS MALFUNCTIONS

ECS LIGHT ON

Illumination of the ECS light indicates low airflow or overtemperature of the avionics cooling air. In either case, avionics damage due to heat is the primary concern. Very low or high engine rpm can degrade ECS operation; therefore, maintain moderate airspeeds and rpm if the ECS light illuminates. Shut down the radar first as it is very heat sensitive and reduces the cooling air available for other systems. Turn off non-essential avionics for their own protection. Avionics that cannot be turned off (AHRS, xfmr rectifiers, IFF, AIC, ADC, signal data recorder, etc.) will continue to be heat damaged. Turning the emergency vent handle dumps cockpit pressurization. Pulling the handle diverts ECS cockpit air to the avionics and allows ram flow to enter the cockpit as a function of handle extension. Turning the cockpit temperature control switch OFF will switch avionics cooling to ram air. The ECS light will continue to monitor avionics cooling air flow and temperature. Optimum ram air cooling is obtained at 400 knots and 15,000 feet.

1. Maintain 250-450 knots (75-85% rpm)

If light remains on -

2. Non-essential avionics - OFF
3. Emergency vent handle - TURN AND PULL (below 25,000 feet)

If light still remains on -

4. Cabin temperature control switch - OFF

OIL SYSTEM MALFUNCTION

Engine oil system malfunctions include over or under pressure, and excessive fluctuations. If the oil pressure stays below 8 psi but above 0 psi and appreciable time at altitude is expected, consider engine shutdown. If oil pressure stays at 0 psi or above 100 psi and the other engine is operating normally, the engine should be shut down to limit damage. If the engine is left running and vibration or other indications of possible engine seizure occur, shut down the engine and make a single-engine landing.

If oil pressure is out of normal range -

1. Throttle - IDLE

If oil pressure below 8 psi or pegged at 100 psi -

1. Throttle - OFF (conditions permitting)

EMER BST ON AND/OR BST SYS MAL LIGHTS ON

The EMER BST ON and BST SYS MAL lights provide indication of the status of both the emergency fuel boost pump system and the emergency generator system. A single light or combination of the lights indicate the following:

EMER BST ON	BST SYS MAL	STATUS/PILOT ACTION
ON	OFF	Status: Emergency fuel boost pump pressure normal and pump powered by emergency generator. Pilot action: Refer to generator failure or boost pump failure as applicable.
OFF	ON	Status: Emergency fuel boost pump failed. Pilot action: Follow applicable boost pump failure procedure.
ON	ON	Status: Emergency fuel boost pump pressure normal but powered by abnormal electrical source. Pilot action: Do not turn main generators OFF or place emergency generator switch to ISOLATE as this may fail the emergency boost pump.

FUEL BOOST PUMPS INOPERATIVE

There are various combinations of indications to warn of a single or multiple fuel boost pump failure. A single boost pump failure is indicated by a L or R BST PUMP light ON or a BST SYS MAL light ON with the EMER BST ON light out. A multiple failure is indicated by two or more of the above lights ON. Total electrical failure including the emergency generator causes total boost pump failure without the usual warning lights. With total boost pump failure, fuel is available to the engine by gravity feed only and fuel vaporization with resulting flameout of one or both engines is probable. Flameout is most likely to occur during the first 30 seconds of gravity feed operation and is more probable above 15,000 feet and/or at low power settings.

Fuel vaporization is caused by a combination of loss of boost pump pressure, and high altitude (low ambient pressure) or high fuel temperature. Fuel temperature is increased by electrical, AMAD, and hydraulic systems heat being transferred to the fuel in the heat exchangers. The radar (and TEWS when installed) are the largest single source(s) of heat transfer. The probability of fuel vaporization can be decreased by reducing fuel temperature and descending to a lower altitude. Increased fuel flow is the most effective method of reducing fuel temperature. Reducing electrical load aids in reducing fuel temperature, but this effect is delayed. The primary consideration is to ensure that at least one engine continues to operate.

SINGLE OR DOUBLE (ANY TWO) FUEL BOOST PUMP FAILURE

With only one boost pump operating, prudence dictates that the aircraft be operated at lower altitude and higher power setting.

1. Land as soon as practical.

BOTH MAIN FUEL BOOST PUMPS AND EMERGENCY BOOST PUMP INOPERATIVE (TOTAL BOOST PUMP FAILURE)

1. Descend to minimum practical altitude using maximum practical power on at least one engine (not afterburner).

   If the situation permits, maintain high power settings for at least 3 minutes to cool the fuel, and descend with both throttles at military power. As the descent becomes more restricted by weather, airspeed, etc., maintain one throttle at military while retarding the other as necessary toward IDLE. If the retarded engine operates at IDLE and additional power reduction is required, you can then retard the advanced throttle as required. Use of the speed brake should be considered.
2. Reduce electrical load to the minimum practical.
3. Maintain split throttles until estabilished in traffic pattern.

   Maintain one engine at as high a power setting as possible until the throttle must be retarded to permit landing.

FUEL TRANSFER SYSTEM MALFUNCTION

The primary indication of a fuel transfer system malfunction is the fuel gage. Other indications include premature FUEL LOW light, bingo light and wing low tendency.

INTERNAL TANK FAILS TO TRANSFER

If feed tank fuel quantity begins to drop with fuel remaining in any transfer tank or one transfer tank fuel quantity remains constant while transfer quantities decrease, a transfer pump has probably failed. If any or all transfer pumps fail, the fuel in the affected tanks will gravity transfer to the feed tanks when tanks with operating transfer pumps are empty and the fuel level (height) in the feed tanks drops below the level of fuel in the affected tank(s). Gravity transfer may be confirmed by observing the simultaneous decrease of fuel quantities in the affected tank(s) and feed tanks. Gravity transfer may not occur until after FUEL LOW light comes on and very low feed tank quantities are reached (300 to 400 pounds in each tank). Gravity transfer will not completely refill the feed tanks, and may not keep up with feed tank usage, depending on total fuel quantity and pitch attitude. For tank 1, increasing pitch attitude by climbing or reducing airspeed during descents maximizes the gravity transfer rate and maximizes the amount of fuel available for gravity transfer. At fuel flow rates above 3,500 pounds per hour per engine, gravity transfer will not keep up with engine demand from the feed tanks. If transfer pump failure is suspected:

1. Throttles - RETARD (less than 3,500 pph/engine)

For tank 1 transfer failure -

2. Slipway switch - CHECK CLOSED (F-15C/D)
3. Maintain approximately 250 knots for cruise and plan for a minimum fuel descent.

EXTERNAL TANK FAILS TO TRANSFER

With wing tanks installed, if the external fuel tanks fail to transfer completely or if STOP TRANS is selected due to an emergency and any external tank, including the centerline, is partially full, the aircraft may exceed the aft CG limit as internal fuel decreases due to fuel moving aft in the external tanks. Cycling the external tank switch or slipway door, may restore transfer. If the landing gear is cycled under these conditions, it may fail to retract. Ensure fuel on board will allow flight to a suitable landing base with the gear down if transfer is not restored. If not, it may be necessary to jettison the tanks for controllability or range considerations. Landing with up to a full tank on one side will normally present no problem, but perform a Controllability Check when practical. With pitch CAS inoperative, the CG shift due to movement of trapped fuel in external tanks can degrade aircraft handling characteristics.

1. External transfer switch - WING/CTR (F-15C/D)
2. External tank/conformal tank fuel control switches - CYCLE
3. Landing gear circuit breaker - IN
4. Slipway switch - CYCLE
5. Throttle(s) - MIL

If external tank still fails to transfer or STOP TRANS is selected -

6. Maintain minimum 250 knots.
7. Use minimum pitch angles for maneuvering.
8. Jettison external tanks if required.

If external tanks are retained -

9. Maintain 18 units AOA on final.

CFT FAILS TO TRANSFER

The only indication of CFT fuel transfer failure is the fuel quantity indicator. There is no provision for transfer of CFT fuel if both transfer pumps on one side fail. If both pumps on one side fail, it may be desirable to stop CFT transfer to maintain balance.

With a single generator failure, if TEWS or ICS is on, the center transfer pumps automatically shut off. If an aft pump fails, the appropriate center pump can be operated by placing the CFT emergency transfer switch to L or R.

If both main generators fail, all CFT transfer pumps automatically shut off. If fuel is not critical, do not transfer CFT fuel. If fuel is critical, CFT fuel can be transferred using the CFT emergency transfer switch. The landing gear handle must be up to prevent fuel from transferring to the other CFT. Wait until internal fuel decreases about 1000 pounds then select L or R. When internal tanks are full, place the switch to NORM. Wait until internal fuel again decreases about 1000 pounds, then select L or R as required to maintain fuel balance. Repeat until the CFT's are empty.

If a generator and aft pump fail -

1. Conformal tank emergency transfer switch - L or R (as required)

If both generators fail and fuel critical -

1. Landing gear handle - UP

After internal fuel decreases about 1000 pounds -

2. Conformal tank emergency transfer switch - L or R

When internal tanks full -

3. Conformal tank emergency transfer switch - NORM
4. Repeat steps 1 thru 3 for opposite CFT.

EMERGENCY FUEL TRANSFER/DUMP, GEAR DOWN

Fuel in external tanks cannot be transferred and/or dumped unless the landing gear handle is up or the fuel low level system is activated. If it is necessary to transfer or dump fuel with the gear down, the following procedure will permit external fuel transfer/dump without raising the landing gear.

1. Emergency landing gear handle - PULL
2. Landing gear handle - UP
3. Fuel gauge - MONITOR
4. Fuel dump switch - DUMP (if required)
5. Landing gear handle - DOWN
6. Emergency landing gear handle - RESET

UNCOMMANDED FUEL VENTING

Fuel flowing unintentionally from the dump mast(s) in flight is, in all probability, due to abnormal venting caused by fuel transfer system and/or fuel pressurization/vent system failures (the probability of a spontaneous dump system failure is extremely low). If fuel dump is selected with abnormal venting, the internal fuel tanks could overpressurize and rupture. Cycling the fuel dump switch may also increase the fuel loss rate. Therefore, the fuel dump switch should not be cycled in an attempt to correct uncommanded fuel venting (cycling the switch is acceptable if normal fuel dumping does not stop when the switch is moved from DUMP to NORM). Feed tank fuel cannot be dumped or vented. Turning the air source knob to OFF may reduce the fuel loss rate if fuel pressurization malfunctions are contributing to the venting flow.

1. Fuel dump switch - NORM
2. External tank/conformal tank fuel control switches - STOP TRANSFER

   If any external tank is partially full, the aircraft may exceed the aft CG limit at light internal fuel weights due to fuel moving aft in the external tanks. In this case, it may be necessary to jettison the external tanks.
3. Slipway switch - Open
4. Air source knob - OFF (below 25,000 feet)

If fuel venting continues and flight to an emergency landing requires more than feed tank fuel -

5. Emergency generator switch - MAN
   The EMER BST ON light should illuminate and the BST SYS MAL light should remain out.
6. Main generator switches - OFF
   If the BST SYS MAL light is on when both generator switches are turned OFF, double engine flameout may occur due to lack of boost pump pressure.
7. Fuel gage - MONITOR FEED TANK
   Feed tanks may be refilled by turning on a main generator thus activating transfer pumps, or by allowing fuel to gravity feed from internal wing tanks.

When feed tank fuel is sufficient for flight to an emergency landing -

8. Main generator switches - ON

INFLIGHT FUEL LEAK

Prompt action is required to isolate the source of the leak to minimize fuel loss and fire hazard. If the leak can be associated with one engine bay, feed tank, or side of the aircraft, then the fire warning light for the engine on that side should be pressed to close the airframe fuel shutoff valve. Placing the throttle OFF will not isolate leaks upstream of the engine fuel control. If the leak is upstream of the airframe fuel shutoff valve, fuel loss may be reduced by stopping all fuel transfer and shutting off the fuel boost pumps. The transfer and boost pumps can be shut off by turning both main generators OFF. This will reduce but will probably not stop the leak. Monitor feed tank fuel quantity and turn the main generators ON as required to prevent feed tank depletion. Failure of some fuel system components can cause loss of all fuel in a few minutes. Consider increasing airspeed (without afterburner) to maximize range by using fuel which would otherwise be lost.

WARNING

Afterburner may ignite leaking fuel.

If leak can be associated with one engine bay -

1. Fire warning light - PRESS
2. Throttle - OFF

If source of leak cannot be determined -

1. Either fire warning light - PRESS
2. Throttle - OFF

If leak continues -

3. Fire warning light - RESET
4. Engine - RESTART
5. Other engine fire warning light - PUSH
6. Other engine throttle - OFF

If leak continues and flight to emergency landing site not assured -

7. External tank/conformal tank fuel control switches - STOP TRANSFER
8. Fire warning light - RESET
9. Engine - RESTART
10. Emergency generator switch - MAN (EMER BST ON light on and BST SYS MAL light out)
11. Both main generator switches - OFF
12. Fuel gage - MONITOR FEED TANKS
13. Main generator switches - ON AS REQUIRED FOR FUEL TRANSFER AND FOR LANDING
14. External tank switches - ON AS REQUIRED

GENERATOR FAILURE

A generator failure is indicated by illumination of the L GEN OUT or R GEN OUT light. The emergency generator will come on and power the emergency boost pump and the EMER BST ON light will illuminate. If the BST SYS MAL light comes on, the emergency generator has probably failed. Normal flight electrical loads (except ECM pods) can be handled by one generator. Check hydraulic warning lights and gages for indication of AMAD failure. Check engine instruments for indication of stall/stagnation or flameout.

1. Generator switch - CYCLE

If generator still failed -

2. Generator switch - OFF

DOUBLE GENERATOR FAILURE

If both generators fail, the emergency generator will automatically power the essential buses providing the emergency generator is not in ISOLATE. The HYDRAULIC caution light and the landing gear warning light will illuminate and the landing gear warning tone will sound. Operation of the landing gear warning light/tone is due to loss of the ADC. The gear should operate normally. Hydraulic system operation can be verified only by proper operation of hydraulic powered systems. Refer to Emergency Power Distribution Chart (figure 3-5) for equipment that will be operative/inoperative when the emergency generator is on line. If either generator can be reset, the electrical system will revert to normal operation.

The following indicators/instruments will fail immediately and will tend to remain at the last valid reading:

Primary airspeed/Mach indicator
Primary altimeter
Vertical velocity indicator
AOA indicator
Exhaust nozzle position indicators
Oil pressure indicators
Fuel flow indicators
Oxygen quantity indicators
PC1 hydraulic pressure indicator
PC2 hydraulic pressure indicator
Utility hydraulic pressure indicator

The HUD will go blank. If double generator failure occurs at night, all instrument and console lights will fail and the flood lights (utility and storm) must be used for cockpit illumination.

Partial failure of the left main generator may be interpreted as a total electrical power failure particularly at night due to loss of all normal cockpit lighting (utility and storm floods are still operative). Power can be restored to all aircraft buses by placing the left generator switch off.

1. EMER BST ON light - CHECK ON
   If the EMER BST ON light is not on, cycle the emergency generator switch to ISOLATE and back to MAN. If the emergency generator does not power the essential buses, engine instruments will be inoperative and will tend to remain at the last valid reading. Operation of the engines can be confirmed by advancing the throttle and noting thrust response.
2. Main generator switches - CYCLE (left generator OFF first)

CAUTION

With both main generators inoperative, the nozzles will stay full closed at idle power with the landing gear down. Idle thrust will be substantially higher than normal.

If main generators still failed and emergency generator is inoperative -

3. Follow Both Main Fuel Boost Pumps and Emergency Boost Pump Inoperative (Total Boost Pump Failure) procedure.
   All internal transfer pumps will be inoperative and fuel will gravity transfer to the feed tanks.

NOTE

Feed tank fuel cannot be monitored. Flameout due to fuel starvation may occur with prolonged use of high power settings. With total electrical failure, the standby attitude indicator will display an OFF flag but is reliable for 9 minutes after loss of electrical power.

AMAD FAILURE

AMAD failure is indicated by the simultaneous loss of the PC system, the utility pump, and the generator on the same side. If this occurs:

1. Throttle - IDLE
2. Reduce electrical requirements as practical.
3. Refer to Electrical and Hydraulic Failures.

If double AMAD failure occurs -

4. Eject	If double AMAD failure occurs, total hydraulic and

electrical power are lost and aircraft control is impossible.

RUNAWAY TRIM

Sufficient control is available to land the aircraft from a runaway trim in any direction. Unless other flight control malfunctions are evident, leave pitch and roll ratio switches in AUTO.

FLIGHT CONTROL SYSTEM MALFUNCTION

The CAS is a highly reliable, two channel, fail-safe system which continuously self-checks its operation. If the CAS senses a malfunction, it will drop itself off line. If a flight control system anomaly is apparent, but adequate aircraft control can be maintained, do not disengage CAS as it may be responsible for maintaining controlled flight. If it were to be disengaged, not only would aircraft control be jeopardized, but it may not be possible to re-engage. If the CAS fails and cannot be reset, handling qualities are satisfactory for most mission tasks. If pitch CAS fails while supersonic above 600 knots, pilot induced oscillations (PIO) may occur. If the malfunction involves both the CAS and the mechanical system, handling qualities may be severly degraded. If the CAS fails during essentially unaccelerated flight, do not attempt repeated resets. Consider landing CAS OFF if CAS problems have occurred in flight. This will preclude disengagement during critical phases of flight. Perform a Controllability Check, if practical, before landing. Evaluate handling qualities at approach speed with the applicable ratio switch in both AUTO and EMERG. Handling qualities may be considerably different at approach speeds than at higher speeds. If selecting EMERG does not noticeably improve controllability, land with the switch in AUTO. If landing with pitch ratio EMERG and pitch CAS OFF, fly a flat 18 unit AOA approach.

If the malfunction appears in pitch -

1. Slow to below 250 knots.

WARNING

If pitch CAS drop-off occurs with conformal fuel tanks installed and before TO 1F-15-881, while in the 0.75 to 1.0 Mach region below 20,000 feet MSL, a nose-up transient will be encountered. Do not retrim before reducing airspeed below 0.75 Mach. If the nose-up stick force is trimmed out before slowing, a nose-down pitch transient will be experienced when decelerating through approximately 0.8 Mach. High airspeed in this flight condition results in significant increase in pitch sensitivity, particularly at low altitude.

If pitch ratio below 0.4 or if aircraft still difficult to control -

2. Pitch ratio switch - EMERG
3. Pitch ratio indicator - OBSERVE 0.4

If pitch ratio EMERG and pitch CAS OFF -

4. Fly a flat 18 unit AOA approach

If malfunction appears in roll -

1. Roll ratio switch - EMERG

WARNING

- Destructive structural loads caused by excessive pitch and yaw excursions can occur during supersonic loaded rolls when the roll ratio light is on at Mach 1.5 or above with the roll ratio switch in AUTO. Until the roll ratio switch is placed in EMERG, avoid high lateral roll rates above Mach 1.5 at negative or high positive g.
- Placing either ratio switch to EMERG will fail the aileron-rudder interconnect (ARI), and will remove pitch and/or roll compensations provided by the ratio changer. Selection of the emergency pitch system will also disable pitch trim compensation. Handling qualities are adequate for recovery.

CAUTION

The reduced stabilator authority, with pitch ratio in EMERG, will prevent normal aerodynamic braking after landing. The limited aerodynamic braking may necessitate lowering the nose and applying wheel brakes early.

RUDDER SYSTEM MALFUNCTIONS

Two different rudder control system malfunctions are possible; failure/jamming of the rudder control cables or failure of a rudder actuator. If the rudder control cable is broken or jammed, flight control inputs which cause rudder movement will probably result in irreversible deflection of one or both rudders. Rudder trim will appear to correct the problem if rudder deflection is small; however, subsequent rudder inputs will aggravate the out-of-trim condition. Failure of a rudder actuator may cause the corresponding rudder to drive to a fully deflected position and remain there. This condition may be visually confirmed through use of mirrors, chase, etc. In either of these failures, the aircraft is controllable as long as the CAS remains on.

WARNING

If a rudder malfunction is apparent, do not turn the CAS off as this may cause loss of aircraft control.

If CAS disengages, a single fully deflected rudder may be counteracted with rudder and aileron; however, depending on the degree of dual rudder deflection, sufficient control may not be available to counteract the effects of a broken/jammed rudder cable. Avoid all unnecessary turns to prevent increasing the amount of irreversible deflection. Avoid unnecessary g loading since aircraft control will be reduced as AOA increases. Consider use of asymmetrical thrust to aid in reducing yaw effects.

SPEED BRAKE FAILURE

If either a hydraulic or electric failure occurs, the speed brake will be closed by air pressures. If the speed brake will not retract, pulling the SPD BK circuit breaker will remove electric and hydraulic power, and allow air load closure.

1. Speed brake circuit breaker - PULL

BOARDING STEPS EXTENDED

Malfunction of the lock-up mechanism can allow the boarding steps to extend in flight. Normally there is no indication, except that the position indicator will indicate DOWN. At high speed, some buffet may be present. The boarding steps have extended in flight at speeds as high as Mach 2 with no adverse effect. However, if the steps fail structurally, pieces will probably enter the left engine inlet. For this reason, if the steps extend, reduce airspeed as soon as practical.

ADC FAILURE

Operation of the Air Data Computer is entirely automatic, and no control over the system is available to the pilot.

The primary indications of ADC failure are failure/freezing (with associated OFF flags) of the primary airspeed, altimeter and vertical velocity, warning light in the landing gear handle, and when airborne, landing gear warning tone. Due to the various systems interface, any or all of the following systems may malfunction or be unreliable if the ADC fails. These are: ECS, Inlets, Pitch Ratio, Altitude Hold, Total Temp, IFF Mode C, LCG, Navigation/Attack Steering, and HUD (except pitch ladder and heading scale).

Pilot action during ADC system malfunction should be based on timely recovery using the standby instruments for flight. Indications of subsequent loss or partial recovery of any of the above secondary systems may be experienced as a result of the aircraft transiting various flight regimes.

ATTITUDE FAILURE

If the ATTITUDE warning light illuminates, but no warning flags are displayed on the ADI, the system not being used for attitude reference is probably at fault. Check the standby attitude indicator to insure the ADI has not failed without indication, then switch to the other attitude source to confirm the failure. If the INS or AHRS system fails, the corresponding light on the BIT panel and the AV BIT light will come on. Compare HUD attitude, AHRS attitude (ADI), and standby attitude indicator for the most usable indication.

WARNING

> A failure can occur which causes false attitude information (pitch or roll) to be displayed on the HUD with no BIT warning. When one axis fails, the other axis may continue to display correct information because the inputs to the pitch and roll axes are independent.

HEADING ERROR

Magnetic heading is available on the HUD, HSI, and standby compass. The HSI heading always comes from the AHRS. The HUD magnetic heading is normally supplied by the INS using INS true heading and CC magnetic variation. If the INS platform fails or the A/D mode is selected, the HUD will automatically display AHRS magnetic heading. If the AHRS is malfunctioning, the heading on the HUD and HSI will be affected (although they may indicate the same heading), and the magnetic variation in the CC will be erroneous. For any heading problems, the same general procedures apply. If any heading problem is suspected:

1. Synch button - PUSH
2. AHRS mode selector knob - COMP or DG.
   If the AHRS platform has not failed, DG may be used. If this mode is inoperative, the COMP position allows direct readout of the magnetic azimuth detector, and the HSI behaves similar to the standby compass (good only in straight and level flight). In either COMP or DG, the CC does not use any AHRS inputs.
3. Magnetic Variation - ENTER
   The HUD should now be correct using INS true heading and correct magnetic variation.

If AHRS DG mode is used -

4. HSI heading - SET TO HUD HEADING
   Push and rotate the AHRS sync knob to set HSI heading. Insure that latitude and hemisphere settings are correct.

INS FAILURE

If the INS platform fails, an INS BIT and ATTITUDE light will normally be illuminated. In this case, the CC will automatically revert to the A/D mode using the AHRS for attitude and heading. Enter correct winds and magnetic variation using the NCI. Some INS failures will not be recognized by the CC. These are usually indicated by erroneous ground speeds, winds and magnetic variation; but the INS attitude is usually still valid. Selecting the A/D mode will cause the CC to use air data for navigation and AHRS for heading and attitude, and winds and correct M/V may be entered. If the mode selector knob is subsequently switched out of A/D, the system will revert to INS winds and M/V (if the INS is operating). Selecting A/D on the mode selector knob without a complete INS failure will inhibit INS ground speed but will retain INS attitude and true heading information. Wind must be entered but M/V will be computed and displayed on the NCI. If large errors are noted in A/D, magnetic variation may be entered manually. When M/V is entered, AHRS heading is used for navigation and other aircraft systems. INS true heading may be reselected, if desired, by selecting INS on the mode selector knob and resetting the CC.

Do not place the mode selector knob OFF in flight. Although this action will not damage the system, no NCI inputs are possible, and no navigation mode is available. If the INS is turned back on (from OFF or CCC) in flight, the platform will attempt to level and will be damaged.

1. Mode selector knob - A/D
2. Wind - ENTER
3. Magnetic variation - ENTER
4. Update with any update procedure.

CENTRAL COMPUTER FAILURE

If a central computer failure occurs or is suspected, attempt to reset the CC. With a CC failure any or all of the following systems are affected: INS, ILS and tacan command steering, VSD, TAS and GS. All HUD symbology except pitch ladder, aircraft symbol and gun reticle are lost. The raw data for ILS and tacan bearing pointer and DME are reliable.

LANDING

CONTROLLABILITY CHECK

If handling characteristics for recovery are suspect, perform a controllability check. If recovery is possible, plan to fly the final approach at the AOA determined in the controllability check and delay reducing power until well into the flare.

1. Attain a safe altitude.
2. Reduce gross weight to minimum practicable.
3. Establish landing configuration.
   Use of flaps is not recommended if structural damage to the wing is suspected.
4. Slow aircraft to no less than on-speed AOA (20-22 units)
   Slow only to that AOA/speed which allows acceptable handling characteristics.

If recovery is possible -

5. Maintain landing configuration and fly straight-in approach no slower than AOA found in step 4.
6. Delay reducing power until well into the flare

SINGLE-ENGINE OPERATION

Single-engine operation provides adequate power for flight. Since loss of electric and hydraulic redundancy is the major concern, make every attempt, consistent with safety and prudence, to have the ailing engine running, even at idle. Otherwise, normal procedures should be followed, making appropriate allowance for reduced thrust. Reduce gross weight as practicable; plan ahead to avoid situations requiring high thrust levels. A windmilling engine can cause repeated flight control transients, reduced control sensitivity, momentary split flaps and CAS disengagements as the hydraulic switchover valves operate. Audible noises may be heard as switchover valves operate. After PC pressure has decreased to near zero, the transients will cease and the CAS may be reset and flap operation will be normal. Monitor hydraulic pressure as windmill rpm sufficient to cause transients may occur with the tachometer indicating 0%. To prevent repeated switchover valve cycling, avoid stabilized flight where engine windmilling conditions produce hydraulic pressure fluctuations between 800-2000 psi.

FLAP MALFUNCTIONS

If a split-flap situation occurs and the flaps cannot be retracted, fly a wider than normal pattern using normal AOA and airspeeds. Sufficient control will be available either

CAS-ON or CAS-OFF under most configurations, but a controllability check should be performed if doubt exists. With CAS-ON, only a slight rolling tendency will be noticed. CAS-OFF, the tendency is more pronounced, but not severe. UTL A and PC1 B, or a UTL B and PC2 B failure will cause a split flap if the flaps are extended.

BLOWN TIRES

Turning the anti-skid system OFF or selecting PULSER (if equipped) prevents continuous loss of brake pressure due to skid sensing on the blown tire and allows braking on the good tire. Without pulser brakes, use caution when braking without anti-skid protection since there is a possibility of blowing the good tire. If both main tires are blown, be prepared to counter any skid with timely nose gear steering inputs in the direction of the skid. The skid potential increases as speed decreases due to loss of vertical tails and rudders effectiveness. Overcorrection, no input at all or initial inputs away from the skid may result in loss of directional control. Maneuvering mode of nose gear steering may be needed for adequate control.

At high speed, lateral stick can be used to maintain a wings level attitude and relieve some of the load on the blown tire. With pulser brakes, the anti-skid switch should be placed from PULSER to OFF when slowed to taxi speed. Stop straight ahead if possible and shut down as soon as fire equipment is available. Do not taxi unless an emergency situation exists.

When landing with a known blown main tire, an approach-end arrestment should be considered to avoid the possible braking/directional control problems discussed above. Landing on the runway centerline is recommended regardless of arrestment options. With pulser brakes, the anti-skid switch should be placed to PULSER before landing. Maneuver conservatively since ARI is disengaged with gear down and PULSER selected.

If a main tire blows on landing rollout, consider a midfield or departure-end arrestment.

If the nose tire is blown, the possibility of engine FOD due to rubber being thrown from the nose wheel exists. Hold the nosewheel off as long as practicable (below 70 kts), and insure engines are at IDLE when nosewheel touchdown occurs.

LANDING WITH KNOWN BLOWN MAIN TIRE

Without pulser brakes -

1. Anti-skid switch - CHECK ON (before landing)
   The anti-skid switch should be left on to provide touchdown protection.
2. Consider approach-end arrestment.
3. Anti-skid switch - OFF (after landing)
   Use light braking on good tire.

With pulser brakes -

1. Anti-skid switch - PULSER (before landing)
2. Consider approach-end arrestment.

BLOWN MAIN TIRE DURING LANDING ROLLOUT

Without pulser brakes -

1. Anti-skid switch - OFF
2. Use light braking on good tire.
3. Hook - AS REQUIRED

With pulser brakes -

1. Anti-skid switch - PULSER
2. Use braking on good tire as required.
3. Hook - AS REQUIRED

ANTI-SKID MALFUNCTION

Illumination of the ANTI-SKID light, either in flight or on the ground, should be interpreted as a potential loss of the normal braking system. Therefore, continued operation should be with the anti-skid switch OFF or PULSER (if equipped). Without anti-skid protection, increased awareness of brake sensitivity and braking requirements is essential. When landing, use aerodynamic braking to the slowest practical speed prior to wheel braking. After lowering the nose, light pedal pressure should be initially applied and then increased slowly. If skidding is sensed, release brakes momentarily and reapply pressure carefully. Management of wheel braking, without anti-skid at high ground speeds is difficult and can result in locked wheels, tire failure, and loss of directional control. On aircraft without pulser brakes, if the anti-skid light is ON and the anti-skid switch is not turned off, normal brakes may not be available and the ARI may remain engaged at wheel spin up. On aircraft with pulser brakes, the pulser brake system will activate automatically when the ANTI-SKID light comes on. If the system does not automatically activate, it can be selected by placing the anti-skid switch to PULSER. When the system is activated, the ARI is disengaged with the gear handle down. Pulser operation can be confirmed by applying brake pedal and feeling the oscillatory brake pressure relief. Limit use of the pulser system to slowing the aircraft from landing speed down to taxi speed. Turn the anti-skid switch OFF when slowed to a comfortable taxi speed. The intensity of brake pressure relief appears to increase as speed decreases even though the pulser brake cycle rate is constant. On all aircraft, if runway length is insufficient for aerobraking followed by non-anti-skid wheel braking, plan an approach-end arrestment. If the ANTI-SKID light comes on inflight or on the ground:

Without brake pulser system -

1. Anti-skid switch - OFF
   Turning the switch off disengages ARI and will restore normal (non-anti-skid) braking with the gear handle DOWN.

With brake pulser system -

1. Anti-skid switch - PULSER
   During pulser operation, pedal pressure over that required for safe deceleration may cause excessive tire wear.

For taxi -

2. Anti-skid switch - OFF
   Aircraft creeps and cannot be completely stopped with pulser brakes.

HYDRAULIC FAILURE

Refer to hydraulic flow diagram (figure 3-2) and BIT panel for systems affected.

A failure of a single hydraulic system is not considered a critical item because of dual systems and reservoir level sensing (RLS) incorporated in the hydraulic system design. Although not considered critical, proper treatment of the situation is warranted, as with any emergency, due to the possibility of subsequent failures which may compound the problem. With UTL A failure, if conditions warrant, recommend an approach-end arrestment. For multiple hydraulic failures, the pilot must refer to the Hydraulic Flow Diagram, this section, to determine systems affected and corrective action required.

UTL A FAILURE

A UTL A failure is the only single hydraulic failure which requires pilot action.

1. If conditions warrant, recommend an approach-end arrestment
2. Refer to Emergency Landing Gear Extension procedure.
3. Emergency brake/steer handle - PULL AFTER NOSEWHEEL IS ON THE GROUND (pulling the emergency brake above 70 knots increases the possibility of blown tires).

UTL A AND PC2 A FAILURE

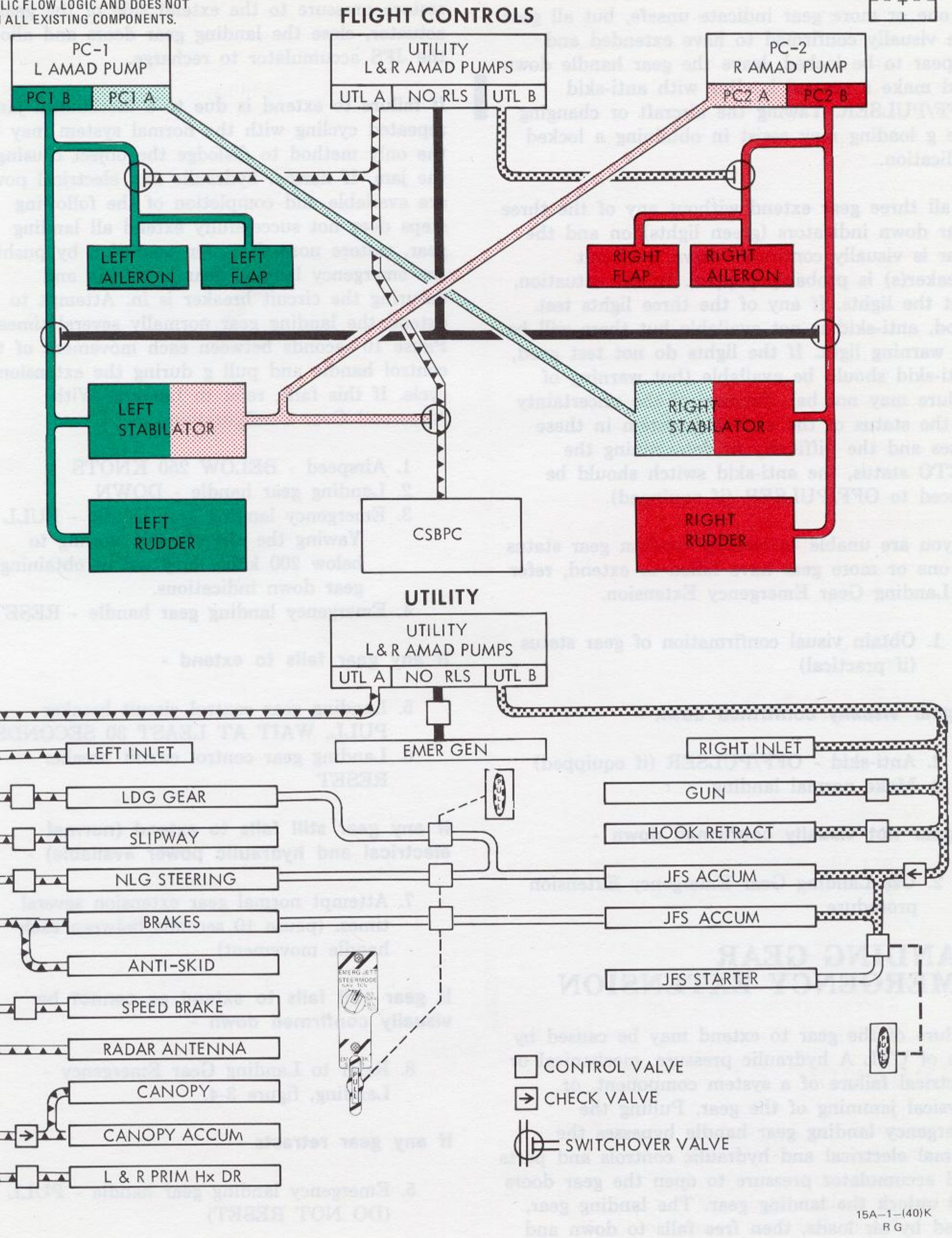
A UTL A and PC2 A failure reduces aircraft control appreciably. The pitch ratio and roll ratio lights will come on.

1. Slow to subsonic.
2. Conduct controllability check, as required.
3. If conditions warrant, recommend an approach-end arrestment
4. Refer to Emergency Landing Gear Extension procedure.
5. Emergency brake/steer handle - PULL AFTER NOSEWHEEL IS ON THE GROUND (pulling the emergency brake above 70 knots increases the possibility of blown tires).

HYDRAULIC FLOW DIAGRAM

NOTE

THIS ILLUSTRATION IS SIMPLIFIED TO SHOW HYDRAULIC FLOW LOGIC AND DOES NOT CONTAIN ALL EXISTING COMPONENTS.



15A–1–(40)K
R G

Figure 3-2

LANDING GEAR UNSAFE

If one or more gear indicate unsafe, but all gear are visually confirmed to have extended and appear to be locked, leave the gear handle down and make a normal landing with anti-skid OFF/PULSER. Yawing the aircraft or changing the g loading may assist in obtaining a locked indication.

If all three gear extend without any of the three gear down indicators (green lights) on and the gear is visually confirmed down, a circuit breaker(s) is probably popped. In this situation, test the lights. If any of the three lights test good, anti-skid is not available but there will be no warning light. If the lights do not test good, anti-skid should be available (but warning of failure may not be). Because of the uncertainty of the status of the anti-skid system in these cases and the difficulty in determining the TCTO status, the anti-skid switch should be placed to OFF/PULSER (if equipped).

If you are unable to visually confirm gear status or one or more gear have failed to extend, refer to Landing Gear Emergency Extension.

1. Obtain visual confirmation of gear status (if practical)

If gear visually confirmed down -

2. Anti-skid - OFF/PULSER (if equipped)
3. Make normal landing

If gear not visually confirmed down -

2. Use Landing Gear Emergency Extension procedure

LANDING GEAR EMERGENCY EXTENSION

Failure of the gear to extend may be caused by loss of UTL A hydraulic pressure, mechanical or electrical failure of a system component, or physical jamming of the gear. Pulling the emergency landing gear handle bypasses the normal electrical and hydraulic controls and ports JFS accumulator pressure to open the gear doors and unlock the landing gear. The landing gear, aided by air loads, then free falls to down and locked. Providing no component or UTL A failure exists, resetting the emergency landing gear handle with the normal handle DOWN will restore pressure to the extend side of the gear actuator, close the landing gear doors and allow the JFS accumulator to recharge.

If failure to extend is due to a mechanical jam, repeated cycling with the normal system may be the only method to dislodge the object causing the jam. If normal hydraulic and electrical power are available and completion of the following steps does not successfully extend all landing gear, restore normal system operation by pushing the emergency landing gear handle in and ensuring the circuit breaker is in. Attempt to extend the landing gear normally several times. Pause 10 seconds between each movement of the control handle and pull g during the extension cycle. If this fails, refer to Landing With Abnormal Gear Configuration.

1. Airspeed - BELOW 250 KNOTS
2. Landing gear handle - DOWN
3. Emergency landing gear handle - PULL
   Yawing the aircraft and slowing to below 200 knots may aid in obtaining gear down indications.
4. Emergency landing gear handle - RESET

If any gear fails to extend -

5. Landing gear control circuit breaker - PULL, WAIT AT LEAST 30 SECONDS
6. Landing gear control circuit breaker - RESET

If any gear still fails to extend (normal electrical and hydraulic power available) -

7. Attempt normal gear extension several times. (pause 10 seconds between each handle movement)

If gear still fails to extend or cannot be visually confirmed down -

8. Refer to Landing Gear Emergency - Landing, figure 3-4.

If any gear retracts -

5. Emergency landing gear handle - PULL (DO NOT RESET)

LANDING WITH ABNORMAL GEAR CONFIGURATION

Before attempting to land with an abnormal gear configuration, consider arresting gear limitations, crosswinds, and other weather factors, runway and overrun condition. If conditions are not favorable - eject. If conditions favor landing, refer to the specific gear configurations shown in Figure 3-4, Landing Gear Emergency - Landing.

When landing with an abnormal gear configuration, fly 18 units AOA with a flat approach, plan on landing on runway centerline and attempt to land 800 to 1,200 feet prior to the cable (if an arrested landing is desired) or in the normal touchdown zone if arrestment is not planned. If an arrestment is planned, enough fuel should be reserved to allow for at least one missed arrestment, go-around and another attempt.

If landing with one main gear up, be prepared to counter wing dip on landing with aileron. Some power may be necessary to hold the non-gear wing up. Attempt to engage the arresting gear in a wings level altitude. If the arrestment is unsuccessful, a go-around should be initiated if fuel and conditions permit. If a go-around is not possible, the anti-skid switch must be placed to OFF (PULSER, if equipped) to restore braking on the extended main gear. This braking, in conjunction with nose gear steering, may assist in maintaining directional control. If landing with missing landing gear wheel (stub strut), refer to Landing Gear Emergency - Landing chart.

APPROACH-END ARRESTMENT

Anticipate a missed engagement. Consider the type of emergency, availability of backup arresting gear, runway condition and length, weather, fuel state, and any other pertinent factors in determining the proper action in event of a missed engagement. With all gear down, touch down at least 800 feet from the arresting gear to allow enough time to lower the nosewheel to the runway before engagement.

WARNING

> Above 35,000 pounds, an arrestment with the nosewheel in the air may result in nose gear failure and extensive aircraft damage.

Throttles must be at idle before engagement. After engagement, control arresting gear rollback using power and light braking and await the arresting gear chief's instruction. Refer to figure 3-3 for engagement limitations.

1. Reduce landing weight.
2. Hook - DOWN
3. Inertia reel - LOCKED
4. Lower nose immediately after touchdown.
5. Throttles - IDLE
6. Engage arresting gear in the center with brakes off.

   Engagements up to 1/4 cable length off-center produce only minor yawing motions which are easily controlled with nosewheel steering.

DEPARTURE-END ARRESTMENT

If there is any doubt about your ability to stop the aircraft on the remaining runway, lower the tail hook. Stopping short of the arresting gear will only require raising the hook, but rolling over arresting gear when it is needed may cause serious damage and/or injury. Engage as close to center as possible, without brakes, and aligned with the runway. Place the hook down at least 2000 feet before the arresting gear, and reduce speed as much as possible. After engagement, use brakes and/or power to reduce arresting gear recoil and await the arresting gear chief's instruction.

1. Hook - DOWN
2. Engage arresting gear squarely with brakes off, throttles idle, and in a three-point attitude.

   Engagements up to 1/4 cable length off-center produce only minor yawing motions which are easily controlled with nosewheel steering.

ARRESTMENT GEAR DATA

MAXIMUM ENGAGEMENT GROUNDSPEEDS

SYSTEM	AIRCRAFT GROSS WEIGHT – POUNDS			
	BELOW 40,000	40,000 to 50,000	50,000 to 60,000	60,000 to 68,000
BAK-9	135 knots	135 knots	130 knots	120 knots
BAK-12/BAK-14	160 knots	160 knots	140 knots	138 knots
BAK-12/BAK-14 Dual or extended runout	145 knots	145 knots	140 knots	138 knots
BAK-13	150 knots	150 knots	145 knots	143 knots
MAAS	150 knots	▨	▨	▨

NOTES

- USE BAK–12 DUAL OR EXTENDED RUNOUT LIMITATIONS UNLESS YOU POSITIVELY DETERMINE THAT STANDARD BAK–12 IS INSTALLED.
- AVOID HARD BRAKING AND/OR ABRUPT STEERING INPUTS DURING ARRESTMENT.
- MAXIMUM ENGAGEMENT SPEEDS ARE VALID ONLY WITH IDLE THRUST.
- FOR ARRESTMENT IN GEAR OTHER THAN THOSE LISTED, ENGAGE AT THE LOWEST POSSIBLE WEIGHT AND SPEED.
- ENGAGEMENTS MAY BE MADE AT SPEEDS SLIGHTLY HIGHER THAN THOSE SHOWN BUT THERE IS THEN A POSSIBILITY OF HOOK FAILURE OR STRUCTURAL DAMAGE.
- A BAK–14 SYSTEM CAN REQUIRE UP TO 7 1/2 SECONDS FROM ACTIVATION TO FULLY UP AND LOCKED. CONTROLLER REACTION TIME WILL INCREASE THIS TIME.

15A–1–(27)J

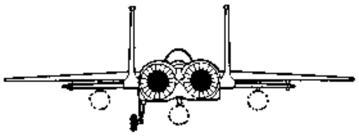
Figure 3-3

LANDING GEAR EMERGENCY – LANDING

BEFORE LANDING CONSIDERATIONS -

1. JETTISON ARMAMENT (CONSIDER RETAINING RACKS)
2. DUMP OR BURN EXCESS FUEL
3. RETAIN EMPTY DROP TANKS (DEPRESSURIZE – OPEN SLIPWAY)
   IF FUEL LOW LIGHT ON, PLACING THE AIR SOURCE KNOB
   OFF IS THE ONLY MEANS TO DEPRESSURIZE THE TANKS
4. FLAPS – DOWN
5. FLY 18 UNITS AOA WITH FLAT APPROACH
6. FOR PLANNED ARRESTMENT, LAND 800 – 1200 FEET PRIOR TO CABLE
7. LAND ON RUNWAY CENTERLINE

LANDING NOT RECOMMENDED



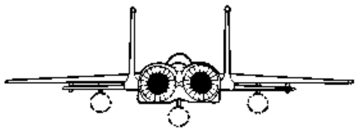
ONE MAIN – NO NOSE

- RETRACT GEAR AND REFER TO ALL GEAR UP

IF GEAR WILL NOT RETRACT –

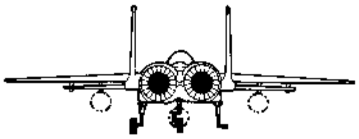
- RECOMMEND EJECT

ARRESTMENT NOT RECOMMENDED



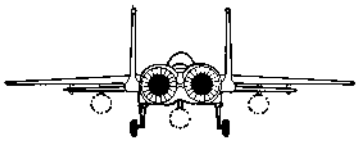
ALL GEAR UP

- 170 KNOTS TOUCHDOWN SPEED



STUB MAIN GEAR

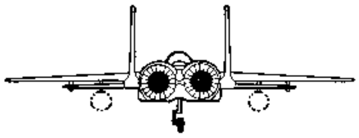
- LOWER, REMOVE, OR LAND PAST CABLE
- ANTI – SKID OFF
- LAND ON SIDE OF RUNWAY TOWARD GOOD GEAR
- HOLD WINGS LEVEL AS LONG AS POSSIBLE
- USE NOSEWHEEL STEERING AND GOOD BRAKE TO MAINTAIN TRACK



BOTH MAIN – NO NOSE/STUB NOSE

- DO NOT SHUT DOWN ENGINES UNTIL STOPPED
- TRY TO HAVE CABLES REMOVED BEFORE LANDING

APPROACH END ARRESTMENT RECOMMENDED

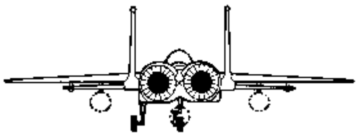


NO MAIN – NOSE DOWN

- JETTISON ℄ TANK
- BE PREPARED TO COUNTER WING DIP
- SAVE FUEL FOR REATTEMPT IF MISSED

IF ARRESTMENT NOT PRACTICAL –

- DO NOT SHUT DOWN ENGINES UNTIL STOPPED



ONE MAIN – NOSE DOWN

- BE PREPARED TO COUNTER WING DIP
- SAVE FUEL FOR REATTEMPT IF MISSED

IF ARRESTMENT NOT PRACTICAL –

- RETRACT GEAR AND REFER TO ALL GEAR UP

IF GEAR WILL NOT RETRACT (ARRESTMENT NOT POSSIBLE) –

- RECOMMEND EJECT

15A–1–(102)H

Figure 3-4

EMERGENCY POWER DISTRIBUTION

EMERGENCY GENERATOR OPERATING

SWITCH IN AUTO OR MAN

L GEN OUT **R GEN OUT**

INOPERATIVE EQUIPMENT

ENGINE -
CFT AFT TRANSFER PUMPS
ENGINE ANTI-ICE
ENGINE OIL PRESS INDICATORS
FUEL FLOW INDICATORS
FUEL TRANSFER PUMPS
ICE DETECTOR
L & R BOOST PUMPS
L & R DUCT TEMP PROBE HEATERS
L & R ENG INLET CONTROLLERS
L & R TOTAL TEMP PROBE HTRS
NOZZLE POSITION INDICATORS

FLIGHT INSTRUMENTS -
ANGLE-OF-ATTACK IND
PRI AIR SPEED/MACH IND
PRI ALTIMETER
VERTICAL VELOCITY IND

NAVIGATION EQUIPMENT -
AUX RCVR
IFF INTERROGATOR (NO IFF DISPLAY ON VSD)
ILS
INS
KY-28/KY-58
STBY COMPASS LT
TACAN
TAKE COMMAND (REAR CKPT)
UHF R/T NO. 2

OTHER -
AIR DATA COMPUTER
ANTI-COLLISION LTS
BIT PANEL
CENTRAL COMPUTER
CONSOLE LTS
FORMATION LTS
HUD
INSTRUMENT LTS (FLT, ENG & AUX)
IRE (IFF REPLY EVALUATOR)
JETTISON USING A/G SELECT AND SELECT JETTISON CONTROLS
KIR (INTERROGATOR COMPUTER)
KIT (TRANSPONDER COMPUTER)
LDG & TAXI LTS
LEAD COMP GYRO
MPCD
OVERLOAD WARNING
OXYGEN GAGE
PC-1 HYD PRESS IND
PC-2 HYD PRESS IND
PITCH RATIO INDICATOR
POSITION LTS
RADAR
SEAT ADJUST
TEW (RWR, EWWS, ICS)
UTILITY HYD PRESS IND
UTILITY-FLOOD LIGHT (REAR CKPT)
VSD
VTRS
WPN NORM RELEASE/LAUNCH
WSHLD ANTI-ICE SVS

15A-1-(74-1)Y

Figure 3-5 (Sheet 1 of 3)

EMERGENCY POWER DISTRIBUTION

EMERGENCY GENERATOR OPERATING

SWITCH IN AUTO OR MAN

L GEN OUT **R GEN OUT**

OPERATIVE EQUIPMENT

ENGINE –
- AMAD FIRE DETECTION SYS
- AMAD FIRE EXTINGUISHER SYS
- BLEED AIR LEAK DETECTOR
- EMER FUEL BOOST PUMP
- [1] ENG AND A/B IGNITITON
- ENG FIRE EXTINGUISHER SYS
- ENG FIRE/OVERHEAT DETECTION SYS
- ENGINE OVERSPEED PROTECTION
- ENG RPM INDICATORS
- FTIT INDICATORS
- FUEL DUMP (EXT TANKS ONLY)
- FUEL LOW & BINGO LT
- [1] FUEL PRESS AND VENT
- FUEL QUANTITY INDICATORS
- L & R ENG FUEL SHUTOFF VALVES
- SELECTED CFT CENTER TRANSFER PUMP

FLIGHT INSTRUMENTS –
- [2] PITOT HEAD HEAT
- [1] STBY AIRSPEED
- [1] STBY ALTIMETER
- STBY ATTITUDE INDICATOR

NAVIGATION EQUIPMENT –
- ADF
- ADI
- ATTITUDE HEADING REF SYS
- COMM AFT (INTERCOM AND TACAN AUDIO SIGNALS)
- HSI
- IFF TRANSPONDER
- UHF R/T/UHF R/T NO. 1

OTHER –
- AERIAL REFUELING
- AERIAL REFUELING FLOOD LTS
- AFCS/CAS
- [5] AN/ALE-45 CMD
- ANTENNA SELECT
- ANTI-SKID
- ARRESTING HOOK
- EMER JETTISON PWR (EMER JETTISON BUTTON)
- ENVIRONMENTAL CONTROL SYS
- FLAPS
- LANDING GEAR
- LANDING GEAR POSITION INDICATORS
- MASTER CAUTION RESET
- NOSE WHEEL STEERING
- PITCH RATIO
- PULSER BRAKE SYSTEM
- SPEED BRAKE
- STORM/FLOOD LTS
- TRIM (AIL/RUD/STAB)
- UTILITY FLOOD LT (FRONT CKPT)
- VOICE WARNING SYSTEM
- WARNING/CAUTION/ADVISORY LTS
- WARNING/CAUTION/ADVISORY/BIT LTS TEST

EMERGENCY GENERATOR OPERATING

SWITCH IN ISOLATE

OPERATIVE EQUIPMENT

- AERIAL REFUELING (DEGRADED OPERATION)
- ARRESTING HOOK
- EMER FUEL BOOST PUMP
- EMER BST ON CAUTION LT
- [1] EMERGENCY NOSEWHEEL STEERING
- [1] ENG AND A/B IGNITION
- [3] ENG RPM INDICATORS
- [1] FUEL PRESS AND VENT
- [1] STBY AIRSPEED
- [1] STBY ALTIMETER

NOTES

[1] ALTHOUGH OPERATIVE, ITEMS ARE NOT POWERED BY THE EMERGENCY GENERATOR.
[2] F-15 C/D ONLY. INOPERATIVE IF CONFORMAL TANK EMERGENCY TRANSFER SWITCH IN LEFT OR RIGHT.
[3] F-15C 83-0035 AND UP; F-15D 83-0049 AND UP.
[5] AFTER TO 1F-15-923

15A–1–(74–2)Z

Figure 3-5 (Sheet 2)

EMERGENCY POWER DISTRIBUTION

SINGLE GENERATOR FAILURE (F-15C/D ONLY)

R GEN OR **L GEN**

INOPERATIVE EQUIPMENT

F-15C 78-0468 THRU 83-0043; F-15D 78-0561 THRU 83-0050; WITH CONFORMAL FUEL TANKS INSTALLED, THE FOLLOWING EQUIPMENT AUTOMATICALLY SHUTS OFF WITH A SINGLE GENERATOR FAILURE UNDER THE STATED CONDITIONS.

CONDITION	INOPERATIVE EQUIPMENT
TEWS — OFF (F—15C/D) ICS — OFF	NONE.
TEWS — ON (F—15C/D) ICS — OFF	CFT CENTER TRANSFER PUMPS. MK 84 PYLON POWER LEFT AND RIGHT TOTAL TEMPERATURE PROBE HEATERS. LEFT AND RIGHT PITOT MAST HEATERS. RIGHT DUCT PITOT HEATER
TEWS — ON (F—15C ONLY) ICS — ON	CENTERLINE ECM POD AND ALL THE EQUIPMENT LISTED WITH TEWS — ON AND ICS — OFF.
TEWS — OFF (F—15C ONLY) ICS — ON	CFT CENTER TRANSFER PUMPS. MK 84 PYLON POWER

F-15C 84-0001 AND UP; F-15D 84-0042 AND UP; WITH OR WITHOUT CONFORMAL FUEL TANKS INSTALLED, THE FOLLOWING EQUIPMENT AUTOMATICALLY SHUTS OFF FOR SINGLE GENERATOR FAILURE UNDER THE STATED CONDITIONS.

CONDITION	INOPERATIVE EQUIPMENT
TEWS — OFF (F—15C/D) ICS — OFF A/G MASTER MODE — OFF OR ON	NONE
TEWS — ON (F—15C/D) ICS — OFF A/G MASTER MODE — OFF OR ON	TEWS (F—15D ONLY) CFT CENTER XFR PUMP WITH CFTS INSTALLED
TEWS — ON (F—15C ONLY) ICS — ON A/G MASTER MODE — OFF	TEWS, ICS BAND 1, JTIDS, TIS, [4] A/G STATIONS 2, 5, 8, LCFT AND RCFT AND, IF INSTALLED, CFT CENTER XFR PUMPS
TEWS — OFF (F—15C ONLY) ICS — ON A/G MASTER MODE — OFF	SAME AS ABOVE, EXCEPT FOR TEWS WHICH IS ALREADY TURNED OFF
TEWS — ON (F—15C ONLY) ICS — ON A/G MASTER MODE — ON	TEWS, ICS BANDS 1 AND 2, JTIDS, TIS AND, IF INSTALLED, CFT CENTER XFR PUMP
TEWS — OFF (F—15C ONLY) ICS — ON A/G MASTER MODE — ON	SAME AS ABOVE, EXCEPT FOR TEWS WHICH IS ALREADY TURNED OFF.

NOTE

[4] BOTH EMERGENCY AND SELECTIVE JETTISON FROM A/G STATIONS RETAINED.

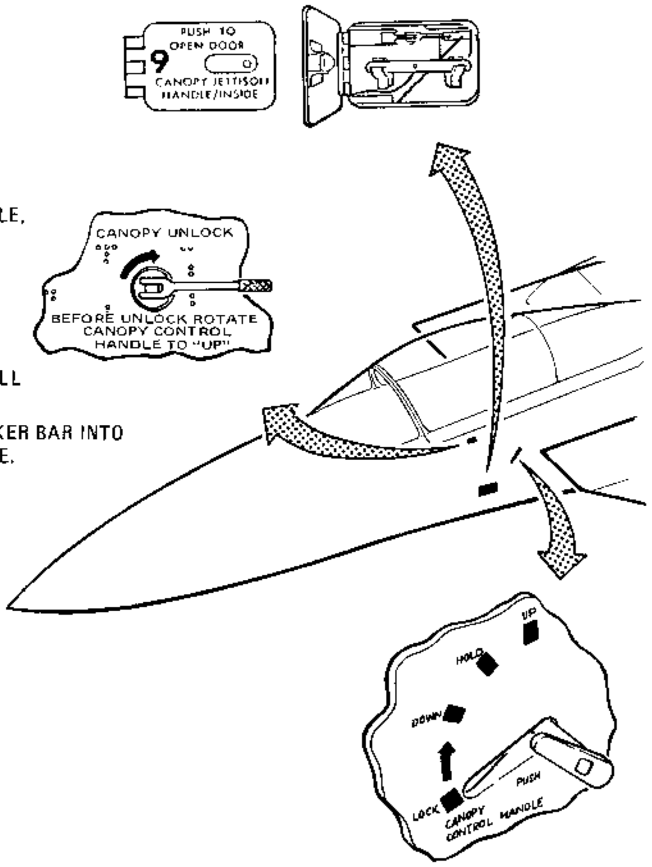
15A—1—(74—3)Y

Figure 3-5 (Sheet 3)

AIRPLANE ENTRY / AIRCREW EXTRACTION

WARNING

IF LEFT ENGINE IS RUNNING, APPROACH AIRPLANE ONLY IF SECURED BY AN ADEQUATE RESTRAINING LINE.


PUSH TO OPEN DOOR
9
CANOPY JETTISON HANDLE/INSIDE
CANOPY UNLOCK
BEFORE UNLOCK ROTATE CANOPY CONTROL HANDLE TO "UP"
UP
HOLD
DOWN
LOCK
PUSH
CANOPY CONTROL HANDLE

NORMAL ENTRY

1. PUSH HANDLE RELEASE BUTTON ON NORMAL CONTROL HANDLE, ALLOWING THE HANDLE TO SPRING OUT
2. ROTATE THE HANDLE FULLY AFT. THE CANOPY WILL UNLOCK AND OPEN.

MANUAL ENTRY

1. ENSURE NORMAL CONTROL HANDLE IS OUT AND ROTATED FULL AFT.
2. (F–15A/C) INSERT 1/2–INCH DRIVE SOCKET WRENCH OR BREAKER BAR INTO EXTERNAL CANOPY UNLOCK FITTING AND ROTATE CLOCKWISE.
3. LIFT CANOPY AND INSTALL SAFETY STRUT.

CAUTION

DAMAGE TO CANOPY SHEAR BOLT WILL RESULT IF CANOPY IS LIFTED TOO HIGH

EMERGENCY ENTRY

1. PRESS BUTTON TO OPEN DOOR 9, AND REMOVE T–HANDLE.
2. TO JETTISON CANOPY, PULL T–HANDLE TO FULL LENGTH APPROXIMATELY 8 FEET) AND YANK HARD.

EXTRACTION - EJECTION SEAT

WARNING

DO NOT ACTUATE EITHER EJECTION SEAT FIRING HANDLE. ROTATE THE EJECTION CONTROLS SAFETY LEVER FORWARD AND UP AGAINST THE LEFT EJECTION FIRING HANDLE TO SAFETY THE SEAT.

1. EJECTION CONTROLS SAFETY LEVER FORWARD TO LOCKED POSITION.
2. RELEASE LAP BELT.
3. RELEASE LEFT AND RIGHT SURVIVAL KIT BUCKLES.
4. RELEASE LEFT AND RIGHT PARACHUTE HARNESS STRAPS.
5. OPEN FACE MASK, IF REQUIRED.

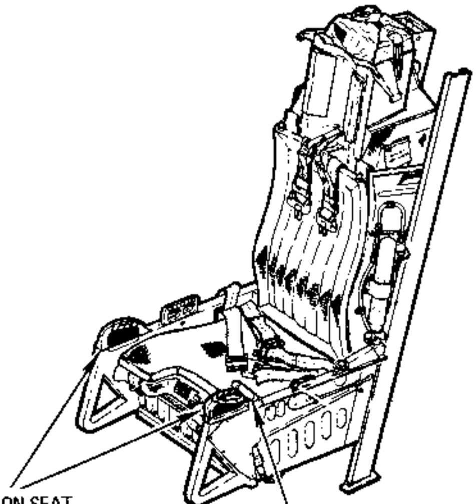


Figure 3-6

EJECTION PROCEDURES

IF TIME AND CONDITIONS PERMIT

- ALERT REAR CREW MEMBER (IF APPLICABLE)
- TIGHTEN LAP BELT
- LOWER HELMET VISOR
- STOW LOOSE EQUIPMENT
- ASSUME PROPER EJECTION POSITION AS SHOWN BELOW (FEET ON RUDDER PEDALS)
- IF AT LOW ALTITUDE ZOOM AIRCRAFT
  THROTTLES – IDLE
- EJECT AT LEAST 2000 FEET (AGL)
- COMMAND SELECTOR VALVE–AFT INITIATE

1. EJECTION CONTROL HANDLES – PULL
   GRASP THE EJECTION HANDLES AND PULL SO THAT THE HANDLES WILL ROTATE UP AND TOWARD THE BACK OF THE SEAT. ALTHOUGH ACTUATION OF EITHER HANDLE IS SUFFICIENT TO INITIATE EJECTION, BOTH HANDLES SHOULD BE GRASPED, IF POSSIBLE, TO PREVENT ARM FLAILING. CONTINUE HOLDING THE HANDLES UNTIL PILOT–SEAT SEPARATION. BE PREPARED TO RELEASE THE HANDLES AT PILOT–SEAT SEPARATION SINCE THE HANDLES WILL NOT DETACH FROM THE SEAT.

WARNING

- MINIMUM ALTITUDES ARE DEPENDENT UPON DIVE ANGLE, AIRSPEED, AND BANK ANGLE. RECOMMENDED MINIMUMS ARE 10,000 FEET (AGL) IF OUT OF CONTROL, AND 2000 FEET (AGL) IN CONTROLLED FLIGHT.
- IF THE COMMAND SELECTOR VALVE IS IN SOLO, THE REAR SEAT WILL NOT EJECT, NOR CAN THE REAR SEAT EJECT ONCE THE FRONT SEAT HAS BEEN EJECTED. FAILURE TO INSTALL THE SOLO FLIGHT COLLAR WILL CAUSE A 0.4 SECOND DELAY IN FRONT SEAT EJECTION.
- IF THE EMERGENCY OXYGEN GREEN RING IS PULLED WHILE STILL IN THE COCKPT, THE AIRCRAFT OXYGEN HOSE MUST BE DISCONNECTED FROM THE CRU–60P CONNECTOR, OR THE EMERGENCY OXYGEN WILL VENT INTO THE AIRCRAFT SYSTEM.

CANOPY SEPARATION FAILURE

IF CANOPY DOES NOT JETTISON AFTER PULLING THE EJECTION CONTROL HANDLE, PULL THE HANDLE AGAIN SHARPLY. IF CANOPY STILL DOES NOT JETTISON, REMAIN IN POSITION FOR EJECTION AND PERFORM THE FOLLOWING WHILE KEEPING ARMS INBOARD IN READINESS TO REGRASP THE EJECTION CONTROL HANDLE.

IF CANOPY FAILS TO SEPARATE

1. CANOPY JETTISON HANDLE – **PRESS UNLOCK BUTTON AND PULL**

IF CANOPY STILL FAILS TO SEPARATE

2. CANOPY CONTROL HANDLE – **UP POSITION**

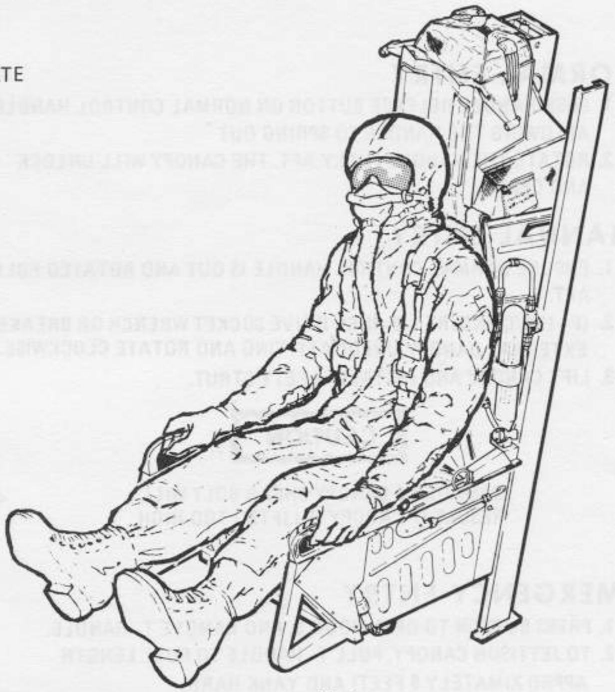
IF CANOPY STILL FAILS TO SEPARATE

3. F–15A/C INTERNAL CANOPY MANUAL UNLOCK HANDLE – **REMOVE QUICK RELEASE PIN AND ROTATE AFT**

WARNING

USE OF THE INTERNAL CANOPY UNLOCK HANDLE MAY RESULT IN SERIOUS INJURY. TO MINIMIZE THE CHANCE OF INJURY, PLACE CLENCHED FIST ON UNDERSIDE OF HANDLE AND PUSH UP. IMMEDIATELY REGRASP THE EJECTION HANDLE AS THE CANOPY BEGINS TO SEPARATE.

4. PULL CANOPY AFT AND THEN PUSH TO OPEN.



Note

REFER TO FOLDOUT SECTION FOR EJECTION SEAT PERFORMANCE CHARTS

WARNING

THE FOLLOWING PROCEDURES ARE PRESENTED AS A LAST RESORT ACTION FOR THE CREW TO DEPART THE AIRCRAFT AND NO IN–DEPTH STUDIES HAVE BEEN MADE TO CONFIRM WHETHER OR NOT THEY WILL BE SUCCESSFUL. CREW SAFETY MAY BE JEOPARDIZED USING THESE PROCEDURES; HOWEVER, THIS MAY BE PREFERABLE TO REMAINING WITH THE AIRCRAFT

EJECTION SEAT FAILURE

IF CANOPY SEPARATES AND EJECTION SEAT DOES NOT FIRE

1. MAINTAIN 200–250 KNOTS, IF POSSIBLE
2. SURVIVAL KIT STRAPS – RELEASE
3. APPLY FULL NOSE DOWN TRIM WHILE HOLDING THE AIRPLANE LEVEL
4. STICK – RELEASE

Note

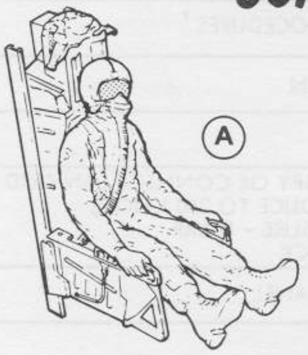
PROCEED FROM STEP 4 TO STEP 5 AS QUICKLY AS POSSIBLE.

5. RESTRAINT EMERGENCY RELEASE – ACTUATE, WHILE PUSHING UPON LEFT PITOT PROBE SUPPORT

15A–1–(127–1)K

Figure 3-7 (Sheet 1 of 2)

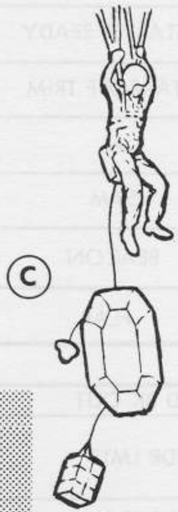
DESCENT AND MANUAL SURVIVAL EQUIPMENT DEPLOYMENT



A IF EMERGENCY OXYGEN FAILS TO RELEASE AUTOMATICALLY UPON EJECTION PULL THE OXYGEN RELEASE RING ON REAR OF LEFT ARMREST.

B AFTER PARACHUTE DEPLOYMENT OPEN THE FACE MASK. IF SURVIVAL KIT DOES NOT DEPLOY AUTOMATICALLY, GRASP KIT HANDLE WITH RIGHT HAND AND PULL.

C LIFE RAFT INFLATION IS INITIATED BY GRAVITY WHEN THE DROP LINE IS FULLE EXTENDED AFTER KIT OPENING.



WARNING

IF THE SURVIVAL KIT IS DEPLOYED AFTER LANDING IN WATER, A SNATCH PULL ON THE DROP LINE (NEAR CO$_2$ BOTTLE) IS REQUIRED TO INFLATE THE LIFE RAFT.

MANUAL SEPARATION

IF BELOW 15,000 FEET (MSL) AND HARNESS RELEASE ACTUATOR FAILS TO OPERATE

WARNING

THE FOLLOWING PROCEDURES BYPASS THE HIGHLY RELIABLE AUTOMATIC SYSTEM AND SHOULD BE USED ONLY AS A LAST RESORT. YOU WILL BE REQUIRED TO MANUALLY ASSIST SEAT/PERSONNEL PARACHUTE CONTAINER SEPARATION.

A PUSH UP ON LEFT PITOT SUPPORT AND SIMULTANEOUSLY PULL THE RESTRAINT EMERGENCY RELEASE HANDLE.

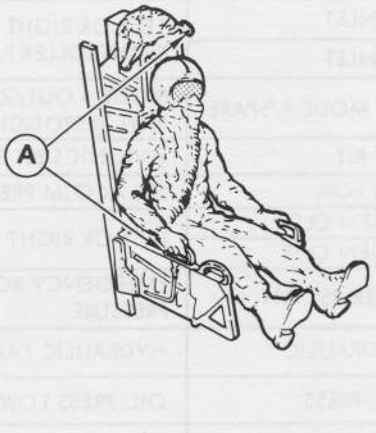
WARNING

DO NOT GRASP THE PITOT SENSING INLET HOUSINGS. SEVERE ARM/HAND INJURY COULD OCCUR IF PARACHUTE MORTAR FIRES WHILE GRASPING THE INLET HOUSINGS.

NOTE

ONCE THE RESTRAINT EMERGENCY RELEASE HANDLE HAS BEEN ACTUATED, THE LAP BELT, INERTIA REEL, SEAT PAN, PERSONNEL PARACHUTE CONTAINER, AND PILOT CHUTE ARE RELEASED. IF THE PILOT CHUTE DOES NOT SEPARATE THE PERSONNEL PARACHUTE CONTAINER FROM THE SEAT, THE CREW MEMBER MAY BE ATTACHED TO THE SEAT BY THE PARACHUTE RISERS.

B JERK ON THE PARACHUTE RISERS, OR USE ANY OTHER METHOD TO FORCE THE PERSONNEL PARACHUTE CONTAINER FROM THE SEAT.



15A–1–(127–2)K

Figure 3-7 (Sheet 2)

WARNINGS/CAUTIONS/INDICATORS

LIGHT/CUE	CAUSE	CORRECTIVE ACTION/REMARKS
FIRE OVERHEAT	EXCESSIVE TEMPERATURE IN INDICATED AREA	REFER TO EMERGENCY PROCEDURES *
LANDING GEAR WARNING LIGHT	GEAR UP & ACFT IN LDNG REGIME, GEAR NOT IN SEL POS, OR NO CON PWR	CHECK CIRCUIT BREAKER IN
WHEELS DN	GEAR DOWN AND LOCKED	INFORMATION
CANOPY UNLOCKED	CANOPY UNLOCKED OR CANOPY ACTUATED INITIATOR LANYARD DISCONNECTED	GROUND: RELOCK CANOPY OR CONNECT LANYARD AIR: AIRSPEED - REDUCE TO 250 KNOTS COCKPIT PRESSURE - DUMP CANOPY - LOCK
MASTER CAUTION	CAUTION CONDITION EXISTS	CHECK CAUTION LIGHT PANEL
REFUEL READY	AIRCRAFT READY FOR AERIAL REFUELING	INFORMATION
STARTER READY	JFS READY TO ENGAGE FOR START	INFORMATION
TAKEOFF TRIM	TAKEOFF TRIM SET	INFORMATION
AI	AIR INTERCEPT THREAT	INFORMATION
SAM	MISSILE THREAT	INFORMATION
BEACON	AIRCRAFT OVER MARKER BEACON	INFORMATION
FLAP	YELLOW-FLAPS IN TRANSIT GREEN-FLAPS DOWN	INFORMATION
	CAUTION LIGHT PANEL	
SPD BK OUT	SPEED BRAKE OUT	INFORMATION*
RUDR LMTR	RUDDER LIMITER NOT SCHEDULING PROPERLY	AVOID LARGE RUDDER INPUT AT HIGH SPEED IF ADEQUATE RUDDER FOR LANDING NOT AVAILABLE-RECOMMEND APPROACH - END ARRESTMENT
BST SYS MAL	EMER BST PMP SYS LOGIC MALF	REFER TO EMERGENCY PROCEDURES *
FUEL HOT	ENGINE FUEL INLET TEMP HIGH	THROTTLES - ADVANCE AS FEASIBLE GROUND - IF LIGHT DOES NOT GO OUT WITHIN 5 MIN, ABORT
TOT TEMP HI	CRITICAL INLET TEMP (3 MINUTE LIMIT)	REDUCE AIRSPEED
ATTITUDE	UNRELIABLE ATTITUDE SOURCE	CHECK STBY ATTITUDE INDICATOR SELECT OPERABLE MODE *
L BST PUMP R BST PUMP	LEFT OR RIGHT BOOST PUMP FAILURE	REFER TO EMERGENCY PROCEDURES *
L INLET R INLET	LEFT OR RIGHT ENGINE INLET CONTROLLER FAILURE	THROTTLE-MIL IF ABOVE MACH 1.0 L OR R INLET RAMP SWITCH-EMERG REDUCE AIRSPEED BELOW MACH 1.0*
IFF MODE 4/SPARE	MODE 4 OUT/ZEROIZED/ NOT RESPONDING	CHECK MODE 4 NOT IN OUT CHECK PROPER A OR B CODE
AV BIT	AVIONICS BIT FAILURE	CHECK BIT PANEL
JFS LOW	JFS ACCUM PRESSURE LOW	JFS START/EMER GEAR/BRAKE/STEER MAY BE INOP *
L GEN OUT R GEN OUT	LEFT OR RIGHT GENERATOR FAILURE	REFER TO EMERGENCY PROCEDURES*
EMER BST ON	EMERGENCY BOOST PUMP SUPPLYING PRESSURE	CHECK BST SYS MAL LIGHT OUT*
HYDRAULIC	HYDRAULIC FAILURE	CHECK HYD GAGES AND BIT PANEL
OIL PRESS	OIL PRESS LOW	CHECK OIL PRESSURE GAGES*
INLET ICE	ICE BUILD UP IN LEFT INLET	ANTI-ICE ENG HEAT SWITCH - ON

* ADDITIONAL INFORMATION AVAILABLE IN THIS SECTION

15A-1-129-1JAB

Figure 3-8 (Sheet 1 of 2)

WARNINGS/CAUTIONS/INDICATORS CONTINUED

LIGHT/CUE	CAUSE	CORRECTIVE ACTION/REMARKS
PITCH RATIO	CSBPC FAILURE, PITCH RATIO INCORRECT OR EMERG SELECTED.	PITCH RATIO SWITCH - EMERG *
ROLL RATIO	ROLL RATIO INCORRECT OR EMERG SELECTED	ROLL RATIO SWITCH - EMERG *
ANTI-SKID	ANTI-SKID INOPERATIVE OR OFF	REFER TO EMERGENCY PROCEDURE *
L EEC	LEFT AND/OR RIGHT EEC FAILED, ENG OVERSPEED OR SWITCH OFF	REFER TO EMERGENCY PROCEDURE*
R EEC		
L ENG CONTR	LEFT AND/OR RIGHT ENGINE CONTROL MALFUNCTION OR SWITCH OFF	REFER TO EMERGENCY PROCEDURE*
R ENG CONTR		
CAS YAW	CONTROL AUGMENTATION SYSTEM INOPERATIVE OR DISENGAGED IN MODE SHOWN	CAS YAW - RESET CAS ROLL-RESET
CAS ROLL		CAS ROLL - RESET
CAS PITCH		CAS PITCH - RESET
L BLEED AIR	LEFT AND/OR RIGHT BLEED AIR LEAK OR OVERTEMP	REFER TO EMERGENCY PROCEDURE*
R BLEED AIR		
WNDSHLD HOT	ANTI-ICE AIR HOT	WINDSHIELD ANTI-ICE SWITCH - OFF
FUEL LOW	LEFT FEED TANK BELOW 540 POUNDS AND/OR RIGHT FEED TANK BELOW 960 POUNDS	USE MINIMUM POWER CHECK ALL TANKS
BINGO FUEL	FUEL AT PRESET AMOUNT	INFORMATION
OXY LOW	2 LITERS OXYGEN REMAINING (A/C) 4 LITERS OXYGEN REMAINING (B/D)	BELOW 1/2 LITER— • DESCEND BELOW 10,000 FEET MSL
ECS	ECS LOW FLOW OR HIGH TEMP	REFER TO EMERGENCY PROCEDURE*
HOOK	HOOK UNLOCKED	SLOW & CYCLE HOOK
AUTO PLT	AFCS AND/OR ALT HOLD DISENGAGE	INFORMATION
BIT PANEL		
L PMP	RIGHT OR LEFT UTILITY PUMP PRESSURE LOW	REFER TO HYDRAULIC FLOW DIAGRAM FOR SYSTEMS AFFECTED IF UTL A FAILURE OR UTL A & PC2 A FAILURE REFER TO EMERGENCY PROCEDURES.
R PMP		
UTL A	DESIGNATED RLS VALVE HAS ACTUATED TO SHUT OFF SUBSYSTEM	
UTL B		
PC1 A		
PC1 B		
PC2 A		
PC2 B		
ADC	ADC FAILURE	THE FOLLOWING MAY BE AFFECTED: ECS, INLETS, PITCH RATIO, ALTITUDE HOLD, TOTAL TEMP, LCG, IFF MODE C, NAV/ATTACK STEERING, HUD (EXCEPT PITCH LADDER AND HEADING SCALE)
ANY BIT LIGHT	DESIGNATED SYSTEM HAS FAILED BIT	CYCLE EQUIPMENT; RESET OR INITIATE BIT (REFER TO SECTION I FOR SYSTEM OPERATION)
COUNTERMEASURES DISPENSER LIGHTS		
PROGRAM	LIGHT ON TEST ONLY	
MINIMUM		
FLARE		
CHAFF		
VOICE WARNING		
WARNING - WARNING	FTIT OVERTEMP LEFT/RIGHT ENGINE FIRE LEFT/RIGHT AMAD FIRE BINGO FUEL FUEL LOW	CHECK COCKPIT INDICATIONS

✱ ADDITIONAL INFORMATION AVAILABLE IN THIS SECTION

15A-1-(29-2)AB

Figure 3-8 (Sheet 2)

SECTION IV

CREW DUTIES

NOT APPLICABLE

SECTION V

OPERATING LIMITATIONS

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GENERAL

All aircraft/system limitations that must be observed during normal operation are covered herein. Some limitations that are characteristic only of a special phase of operation (emergency procedures, flight through turbulent air, etc.) are not covered here; however, they are contained along with the discussion of the operation in question.

NOTE

All references to airspeed quoted in knots refer to calibrated airspeed.

CREW REQUIREMENTS

The minimum crew for safe flight in F-15B/D aircraft is one.

INSTRUMENT MARKINGS

Instrument markings are shown in figure 5-1.

ENGINE LIMITATIONS

Refer to figure 5-2.

PRIMARY FUEL

NATO F-40 may not contain corrosion inhibitor at some locations. Operation without corrosion inhibitor should be restricted to 10 consecutive hours.

ALTERNATE FUEL

The aircraft may be operated on JP-8, NATO F-34, NATO F-35, JP-5, NATO F-43, NATO F-44, or commercial JET A-1 and JET B. Except for freeze point and possible icing and corrosion inhibitor differences, JET B and JP-4 are equivalent and the same operating limitations apply.

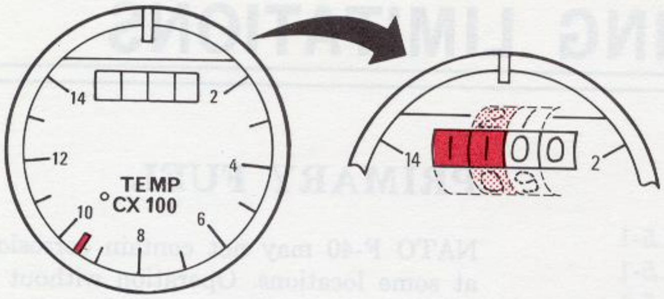
NOTE

Alternate fuels are much more prone to leak than JP-4. Guidelines provided in TO 1-1-3 should be used to evaluate leaks when they occur.

Operating and throttle handling limitations for approved alternate fuels are the same as for primary fuels except: Ground starts with temperature below −20°C (−4°F) with alternate fuel may produce more smoke and require a longer time for engine light-off. Ground starts should not be attempted with fuel temperature below −40°C (−40°F). When using alternate fuels, hot starts may occur during spooldown airstarts at airspeeds less than 350 knots for altitudes above 30,000 feet. Alternate fuel airstarts may require longer engine light-off times.

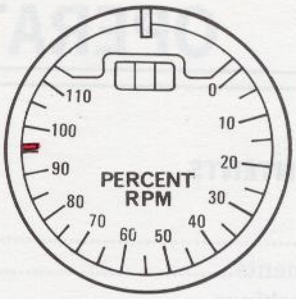
Alternate fuels may be intermixed in any proportion with primary fuels during ground or air refueling operations. No change in operating limitations, retrim not required. Most alternate fuels are heavier, refer to Fuel Quantities in section I.

INSTRUMENT MARKINGS



🟥 970° MAXIMUM STEADY STATE INFLIGHT

FTIT TEMPERATURE



🟥 96% RPM MAXIMUM STEADY STATE INFLIGHT

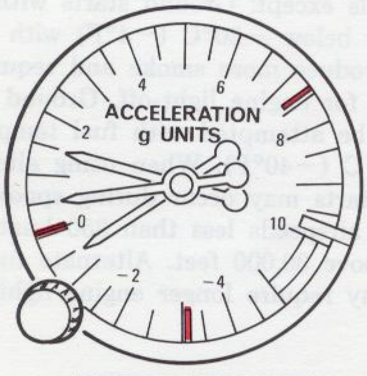
TACHOMETER

[redacted]

1 +7.3G 🟥 MAXIMUM POSITIVE LOAD FACTOR AT 37,400 POUNDS OR BELOW.

ZERO G 🟥 ZERO G EXCEPT TRANSIENT PROHIBITED.

-3.0 G 🟥 MAXIMUM NEGATIVE LOAD FACTOR AT 37,400 POUNDS OR BELOW.



ACCELEROMETER

NOTES

- THE ACCELEROMETER AND HUD DISPLAY INDICATES UP TO 1G LOW WHEN PULL IN RATES ARE HIGH (1G/SEC OR MORE).
- REFER TO ACCELERATION LIMITATIONS FOR ADDITIONAL RESTRICTIONS.

1 WITH OWS INSTALLED AND OPERATING, MAXIMUM POSITIVE LOAD FACTOR FOR EXISTING FLIGHT CONDITION IS INDICATED ON THE HUD.

15A-1-(109-1)M

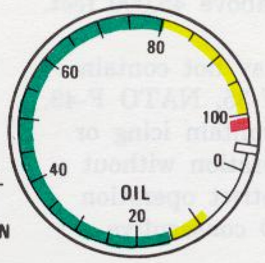
Figure 5-1 (Sheet 1 of 2)

🟥 8 PSI–MINIMUM

🟥 100 PSI–MAXIMUM

🟩 15–80 PSI – NORMAL

🟨 8–15 PSI– 80–100 PSI– CAUTION



NOTES

OIL PRESSURE FLUCTUATIONS OF ±10 PSI ARE ACCEPTABLE.

ANY OIL PRESSURE FROM 0 TO 100 (PEGGED) PSI IS ACCEPTABLE DURING START AND INITIAL OPERATION FOR A PERIOD NOT EXCEEDING 1 MINUTE AFTER REACHING IDLE.

AT LESS THAN +1.0G, THE OIL PRESSURE MAY DROP AS LOW AS 0 PSI.

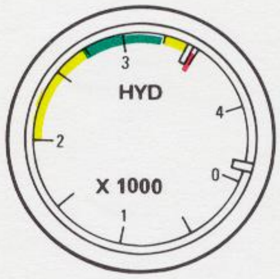
OIL PRESSURE

🟩 2750 – 3250 PSI – NORMAL, (NO DEMAND ON SYSTEM)

🟨 2000 – 2750 NORMAL WITH RAPID CONTROL MOVEMENT

🟨 3250 – 3400 IF PRESSURE EXCEEDS 3250 STEADY STATE, AN ENTRY MUST BE LOGGED ON FORM 781.

🟥 3400 MAXIMUM



HYDRAULIC PRESSURE

15A-1-(109-2)N
RGY

Figure 5-1 (Sheet 2)

Due to alternate fuel freeze points, fuel in external tanks may not transfer after sustained operation (5 minutes or longer) below 200 knots above 25,000 feet or 250 knots above 45,000 feet.

NATO F-34 and NATO F-44 may not contain corrosion inhibitor and NATO F-35, NATO F-43, JET A-1 and JET B may not contain icing or corrosion inhibitors. Restrict operation without icing inhibitor to one flight. Restrict operation without corrosion inhibitor to 10 consecutive hours.

Refer to TO 42B1-1-14 for additional fuel usage data.

SYSTEMS RESTRICTIONS

JFS LIMITATIONS

JFS limitations are shown on figure 5-4.

BRAKES

Maximum braking is prohibited without nosewheel on the runway.

EXTERNAL FUEL TRANSFER

Selecting stop transfer can produce an adverse CG condition due to movement of fuel in partially filled external fuel tanks. With pitch CAS off, external fuel transfer should not be stopped except in an emergency.

NEGATIVE G FLIGHT

Negative g flight is limited to 10 seconds at all power settings.

AIRSPEED LIMITATIONS

Maximum airspeeds are shown in figure 5-3. Additional limitations may be imposed by external stores, refer to figure 5-6. Limiting airspeed for operation of various aircraft systems are shown in figure 5-4.

a. Before TO 1F-15-881, for aircraft with conformal fuel tanks installed, maximum airspeed below 5000 feet AGL is Mach 0.75.
b. Before TO 1F-15-641, if cracks within specified limits to the 6 inch pod support fitting are discovered, maximum airspeed below 5000 feet MSL is 560 knots.

PROHIBITED MANEUVERS

GENERAL

a. AOA over 30 units with any of following:
   1. Fuel asymmetry over 600 pounds.
   2. Fuel asymmetry over 200 pounds when the asymmetric missile load is 3 or more.

      Fuel asymmetry is the summation of any combination of imbalance between

ENGINE LIMITATIONS

GROUND

CONDITION	FTIT °C	RPM %	OIL PSI	REMARKS
START	680	–	–	
IDLE	–	–	15-80	
MILITARY/AB	960	94	30-80	NOTES 2, 5, & 6
TRANSIENT	970	94	30-80	NOTES 2, 5 & 7
FLUCTUATION	±10	±1	±10	NOTES 2, 3, & 4

FLIGHT

CONDITION	FTIT °C	RPM %	OIL PSI	REMARKS
AIRSTART	800	–	–	
IDLE	–	–	15-80	
MILITARY/AB	970	96	30-80	NOTES 1, & 2
TRANSIENT	990	96	30-80	NOTES 2 & 8
FLUCTUATION	±10	±1	±10	NOTES 2, 3, & 4

NOTES

1. USE OF THE Vmax SWITCH IS PROHIBITED.
2. LIMITATIONS INCLUDE FLUCTUATIONS.
3. IN PHASE FLUCTUATION OF MORE THAN ONE INSTRUMENT, OR SHORT TERM CYCLIC FLUCTUATIONS ACCOMPANIED BY THRUST SURGES, INDICATE ENGINE CONTROL PROBLEMS.
4. NOZZLE FLUCTUATIONS ARE LIMITED TO ±2% AT MILITARY POWER AND ABOVE. FLUCTUATIONS ARE NOT PERMITTED BELOW MILITARY POWER.
5. FOR ENGINE OPERATION AT MILITARY OR ABOVE, OIL PRESSURE MUST INCREASE 15 PSI MINIMUM ABOVE IDLE OIL PRESSURE.
6. ENGINE NOZZLE POSITION IS LIMITED TO 30% OPEN OR LESS AT MILITARY POWER.
7. MAXIMUM TEMPERATURE LIMITED TO 30 SECONDS.
8. MAXIMUM TEMPERATURE LIMITED TO 10 SECONDS.

15A-1-(119)P

Figure 5-2

the internal wing tanks and/or the conformal fuel tanks, when installed. For example, if the right CFT has 400 pounds more than the left CFT and the left internal wing tank has 200 pounds more than the right internal wing tank, the net fuel asymmetry is 200 pounds. Asymmetric missile load is the summation of any combination of missile loadings. For example, 4 missiles (any type) on one side and 1 missile on the other side result in an asymmetric missile load of 3 missiles. Fuel asymmetry shall not be used to balance missile asymmetry in determining compliance with this limitation.

  3. Wing-mounted tanks, cargo pods, or air-to-ground stores (Symmetric empty BRU-26A/A do not limit AOA).
  4. Gear down.

b. Spins.

c. Zero G flight, except transient.

ROLLS

a. Full lateral stick rolls in excess of 360°.

b. Full lateral stick rolls in excess of 180° initiated at less than +1.0 g or greater than +3.0 g.

c. Rolls in excess of 360° under any of the following conditions:

  1. Airspeed above 550 knots or Mach 1.4, whichever is less.
  2. Any CAS axis disengaged.

d. Roll in excess of 180° initiated at other than +1.0 g above 500 knots or Mach 1.4, whichever is less.

NOTE

For all aircraft configurations not specifically prohibited herein, with full CAS, mild to moderate rolls below 550 knots or Mach 1.4, whichever is less, are not limited by bank angle change or initial g provided that the OWS limit is not exceeded (voice warning activated) or, without an operative OWS, the unsymmetrical acceleration limits shown in figure 5-5 are not exceeded. Longitudinal control coordination may be required to prevent g excursions outside these limits during the roll.

e. Rolls in excess of 90° with gear down.

f. Rolls at more than 20 units AOA, below Mach 1.0 with PITCH RATIO or ROLL RATIO light ON.

g. Rolls with roll CAS on, above 475 knots below 12,000 feet, with abrupt lateral stick deflection. Such rolls shall be performed with smooth lateral stick deflections. Close formation flight in this speed/altitude region is not recommended.

WITHOUT OPERATIVE OWS

a. With wing-mounted tanks, cargo pods, or air-to-ground stores:

  1. Rolls over 360°.
  2. Rolls over 180° started at other than +1.0 g.
  3. Rolls at less than 0.0 g above 600 knots.

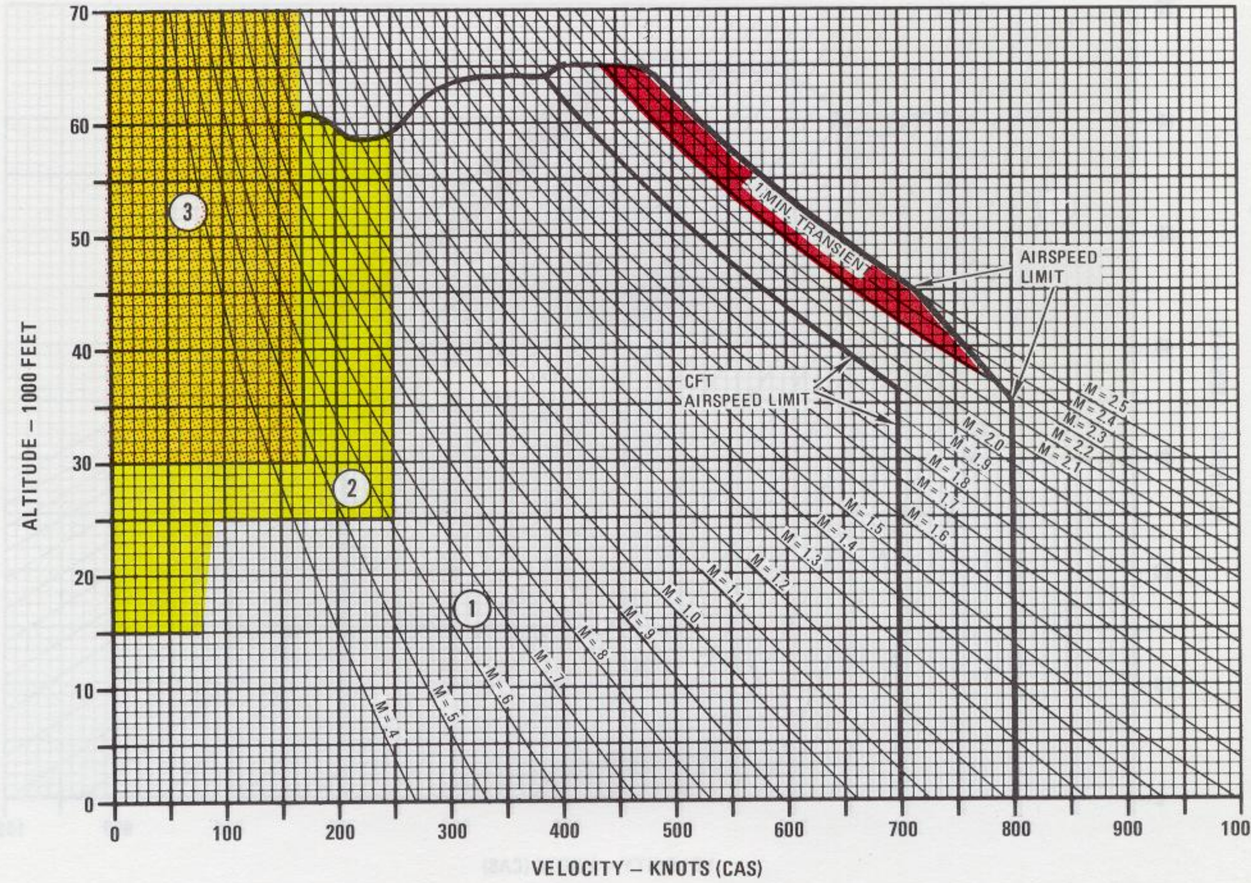
b. More than 1/2 lateral stick with full or partially full CFT's, full or partially full wing-mounted tanks, cargo pods, or air-to-ground stores or, above Mach 1.0, with empty wing-mounted tanks.

CAS OFF

a. Operation above 600 knots with any CAS axis OFF or inoperative.

AIRSPEED LIMITATION AND AFTERBURNER OPERATING ENVELOPE

F100-PW-100 ENGINE



NOTES

REGION 1 – UNLIMITED AFTERBURNER OPERATION. FAILURE TO LIGHT, RUMBLE AND BLOWOUTS SHOULD NOT OCCUR.

REGION 2 – AFTERBURNER FAILURE TO LIGHT, RUMBLE OR RUMBLE BLOWOUTS MAY OCCUR DURING RAPID TRANSIENTS FROM LOW POWER SETTINGS BUT SHOULD NOT OCCUR DURING STEADY-STATE AFTERBURNER OPERATION, TRANSIENTS FROM MILITARY OR DURING MODULATION WITHIN AFTERBURNER.

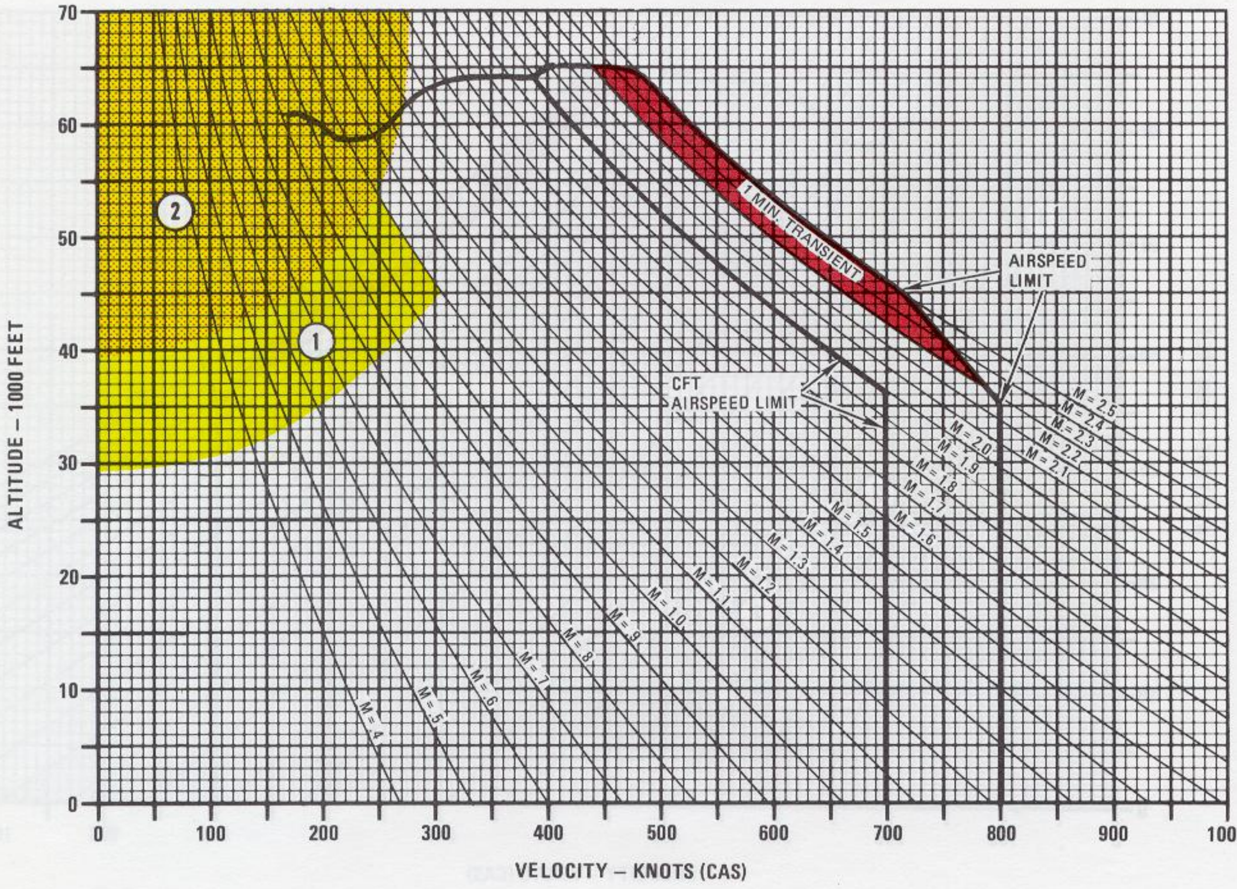
REGION 3 – AFTERBURNER FAILURE TO LIGHT, RUMBLE AND BLOWOUTS ARE PROBABLE DURING TRANSIENTS FROM ALL POWER SETTINGS AS WELL AS DURING STEADY–STATE OPERATION.

RY
15A-1-(111)L

Figure 5-3

AIRSPEED LIMITATION AND AFTERBURNER OPERATING ENVELOPE

F100-PW-220 ENGINE



NOTES

THE DEEC AUTOMATICALLY LIMITS AFTERBURNER OPERATION TO ALLOW UNRESTRICTED THROTTLE MOVEMENT THROUGHOUT THE FLIGHT ENVELOPE.

REGION 1 – DEEC LIMITS INITIATION OF AFTERBURNER SEGMENTS TO I THRU IV. SEGMENT 5 BLOCKED.

REGION 2 – DEEC LIMITS AFTERBURNER SEGMENT TO SEGMENT 1 OR BLOCKS SEGMENT SEQUENCING.

RY
15A-1-(274)

Figure 5-3A.

GROSS WEIGHT LIMITATIONS

For F-15A/B aircraft, the maximum allowable gross weight for all aircraft operation is 56,000 pounds.

For F-15C/D aircraft, the maximum allowable gross weight for all aircraft operation is 68,000 pounds.

CAUTION

> At heavy gross weight (above 58,000 pounds), avoid abrupt nose gear steering inputs and make turns at minimum practical speed and maximum practical radius.

CENTER OF GRAVITY LIMITATIONS

Without CFT's and with wing pylons, the forward CG limit is 23% MAC (gear down). In all other cases, below 62,000 pounds gross weight, the forward CG limit is 22% MAC (gear down). Add 0.1% MAC for each 600 pounds above 62,000 pounds gross weight.

Without CFT's, the aircraft CG limit (gear up) is as follows:

a. With wing pylons - 29.0% MAC.
b. Without wing pylons - 29.9% MAC.

With CFT's, the aft CG limit (gear up) is 29.7% MAC.

ACCELERATION LIMITATIONS

With the Overload Warning System (OWS) operative, the maximum allowable acceleration is continuously displayed on the HUD. The OWS tones indicate proximity to the maximum allowable g (85% and 92% of maximum g) and the OWS voice warning indicates that the maximum allowable g is exceeded.

With the OWS inoperative (maximum allowable g not displayed on the HUD), the maximum accelerations allowed for flight in smooth or moderately turbulent air are as shown in figure 5-5. Separate plots are provided for symmetrical maneuvers (maneuvers under g loading other than 1g without any roll rate) and unsymmetrical maneuvers (maneuvers under g loading other than 1g with an accompanying roll rate such as rolling pullouts, etc.).

Maximum acceleration may be reduced by limitations applicable to a specific store as shown on the External Stores Limitations chart.

A/A 37U-36 (AGTS) PERFORMANCE LIMITATIONS

The inflight performance limitations of the A/A 37U-36 (AGTS-36) Aerial Gunnery Tow Target System is shown in figure 5-5A. The limitations are applicable to aircraft with and without CFT.

EXTERNAL STORES LIMITATIONS

Only the external stores configurations shown in the External Stores Limitation chart (figure 5-6) and those configurations derived during the normal release sequence from a depicted configuration may be loaded and carried. AN/ASQ-T-11 Pod, AIM-9 series, and AIM-7 series missiles may be carried in conjunction with any combination loading on stations 2, 5, and 8. Stores may be released singly or in combination unless otherwise noted. Mixed loads are authorized with the following restrictions:

a. Stores may not be mixed on the same multiple ejector rack.
b. Simultaneous release of different stores is prohibited.

This chart indicates store-to-airframe structural and flight handling characteristic compatibility only; electro-magnetic radiation compatibility is indicated in the applicable equipment technical order when not stated in the Remarks column. For airspeed and Mach number limits, BAL refers to the basic aircraft limits shown in figure 5-3. For acceleration limits with OWS, BAL refers to the limit shown on the HUD and indicated by the voice warning. External store limits other than BAL are not programmed in the OWS. Where only a positive g limit is shown, the negative g limit is the OWS limit. For acceleration limits without OWS, BAL referes to the basic aircraft limits shown in figure 5-5. Without OWS, where only a positive g limit is shown, the negative g limits shown in figure 5-5 apply.

Jettison of external wing stores causes g transients due to a CG shift and momentary disruption of airflow patterns around the stabilators that occurs as the stores depart the aircraft. The limits shown in figure 5-6 are based on aircraft structural limits if the stores are jettisoned at the maximum jettison speed. The magnitude of the transient increases as speed increases and is more pronounced for heavy stores, such as full external wing tanks. These limits were established in this manner in order to allow the pilot the largest possible jettison envelope.

CAUTION

If centerline or inboard release is required with the landing gear down, damage may occur to the aircraft.

SYSTEMS LIMITATIONS

AIRSPEEDS

LANDING GEAR EXTENSION, RETRACTION OR FLIGHT WITH GEAR EXTENDED	300 Knots +1.25g load factor (clean or CFT with or without missiles) 250 Knots +2.0g load factor (any configuration) Maintain Minimum Sideslip
FLAPS	250 Knots +3.0g load factor
CANOPY OPEN (INCLUDING WIND)	60 Knots

SYSTEMS

JET FUEL STARTER (JFS)	Maximum 10 seconds (15 seconds if temperature below 0°F) between JFS start initiation and READY light. Starter engagement time shall not exceed 90 seconds except, if a hot start occurs, the time may be extended to 150 seconds. Minimum 10 seconds between first engine at idle speed and engagement for second engine start. If the engine engagement time exceeds 90 seconds, wait 20 seconds before again engaging or shutting down the JFS.
FLIGHT CONTROLS	To insure the flight control hydraulic fluid is sufficiently warm before takeoff, observe the listed warm up times for the corresponding temperature range.

Temperature	Time (minutes)
+4°C (+40°F) AND UP	No restricton
−4°C (+25°F) to +3°C (39°F)	5
−18°C (0°F) to −5°C (+24°F)	8
−32°C (−26°F) to −19°C (−1°F)	10
−46°C (−50°F) to −33°C (−27°F)	12

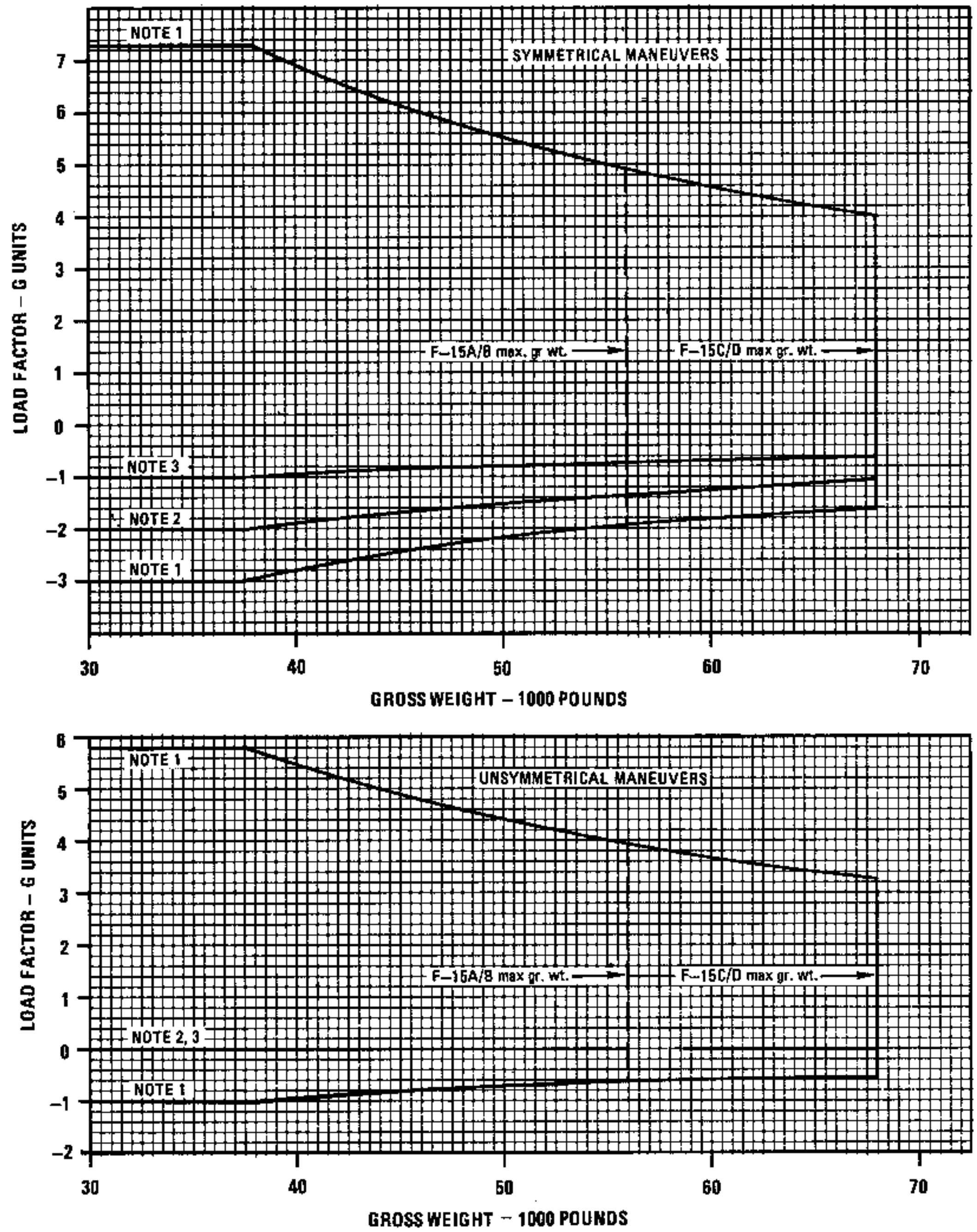
15A-1-(110)K

Figure 5-4

ACCELERATION LIMITATIONS WITHOUT OVERLOAD WARNING SYSTEM OPERATING

NOTE

SEE EXTERNAL STORES LIMITATIONS FOR ADDITIONAL ACCELERATION LIMITATIONS



NOTES:
1. Basic airplane with or without AIM–7 and/or AIM–9
2. Above Mach 1, with external wing tanks or air–to–ground stores
3. Above 600 KCAS with CFT's and wing stores

15A–1–(114)H

Figure 5-5

A/A 37U-36 (AGTS-36)PERFORMANCE LIMITATIONS

FLIGHT CONDITION	MAXIMUM AIRSPEED (KCAS)	MAXIMUM MACH NO.	ALTITUDE (FEET) (MSL)	ACCELERATION – G		MAXIMUM ROLL RATE DEG/SEC	MAXIMUM BANK ANGLE – DEG	AOA UNITS
				SYM	UNSYM			
Captive Carriage	375 ①	0.9	Maximum 40,000	0.0 To +3.0	0.0 To +2.4	60	Bal	Bal
Deployment/ Recovery	250	0.6	Maximum 25,000 Minimum 1,000	+1.0 ②	+1.0 ②	15	30	Bal
Tow	Maximum 500 Minimum 230	0.95	Maximum 40,000	−1.0 To +6.0	0.0 To +4.0	0 To 15 Units AOA: 60 ③ 15 To 20 Units AOA: 30 ③	135	20

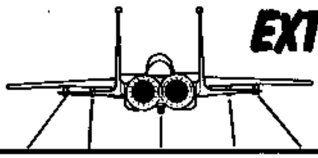
① If accidental deployment of visual augmentor occurs, limit maximum airspeed to 250 KCAS and follow deployment limits.

② No maneuvers permitted when target set (with or without visual augmentor) is less than 100 feet behind tow aircraft. 1G deployment/recovery limits should only be exceeded when performing maneuvers associated with the small deployment/recovery roll rate and bank angle limits.

③ No abrupt reversals.

15A-1-(273)

Figure 5-5A.



EXTERNAL STORES LIMITATIONS WITHOUT CFT

WEIGHTS INCLUDE
SUSPENSION EQUIPMENT

NA – NOT APPLICABLE
NE – NOT ESTABLISHED
BAL – BASIC AIRCRAFT LIMITS

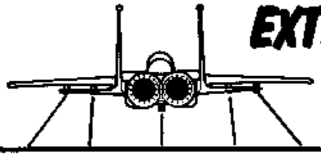
STORE	LINE NUMBER	STATION LOADING AND SUSPENSION					MAXIMUM KCAS OR IMN WHICHEVER IS LESS			ACCELERATION–G				MAX DIVE FOR DEL	STORES CONFIGURATION WEIGHT LBS	REMARKS
										CARRIAGE						
		1	2	5	8	9	CARRIAGE	EMPLOY-MENT	JETTISON	SYM	UNSYM	EMPLOY-MENT	JETTISON			
AIM-9P AIM-9P-1 Missiles	1		✱✱ ①② ③④		✱✱ ①② ③④		BAL	BAL	600 2.3 ⑤	BAL	BAL	0.5 to +7.33	+0.5 to +2.0 ⑤	NA	1586 ⑥	① Combined carriage between line numbers 1, 2, & 3 is prohibited. ② Adapters without launchers authorized if covers installed. ③ USAF approved dacron cord fix to prevent rolleron uncaging is mandatory on AIM-9P series missiles. ④ Wings without rollerons, guide vanes dampers, and cager assemblies may be used on the ATM-9L-4 training missile if all four wings have these parts removed. ⑤ Jettison limit is for pylon jettison only. ⑥ Subtract 690 pounds from stores configuration weight and 6.6 from total drag index if other inboard pylon mounted stores are loaded.
AIM-9P-2 AIM-9P-3 Missiles	2														1626 ⑥	
AIM-9L ATM-9L-4 AIM-9M Missiles	3														1678 ⑥	
AIM-7F AIM-7M Missiles	4	MISSILE STATIONS FWD AFT	3 ✱	4 ✱	6 ✱	7 ✱	BAL ⑦	150 TO 800 2.3	1.0 ⑧	BAL	BAL	-0.5 to +7.33	+0.5 to +3.0 ⑧	NA	2040	⑦ Carriage of dummy training missile prohibited ⑧ Jettison between 250-350 knots, 1g, when tanks or AG weapons on stations 2 & 8. CAUTION ● With tanks or AG weapons on stations 2 or 8 employment of aft AIM-7 missiles is prohibited within the following parameters: a. At or below 1g. b. At or below 2g below 18,000 feet and above 465 knots. ● An aft missile will not be free of possible wing store interference until about 1 1/2 seconds after pressing the weapon release button.
SUU-60/A C_L Pylon	5			▮			BAL	NA	700 1.4	BAL	BAL	NA	+0.5 to +2.0	NA	296	
SUU-59/A Inboard Pylon	6		▮		▮		BAL	NA	1.0	BAL	BAL	NA	+0.5 to +2.0	NA	690	
SUU-60A SUU-59A	7		▮	▮	▮		BAL	NA	1.0	BAL	BAL	NA	+0.5 to +2.0	NA	986	

NOTE: AIM-9 series missiles may be carried with any combination loading on stations 2, 5, & 8.

NOTE: AIM-7 series missiles may be carried with any combination loading on stations 2, 5, & 8

15A-1-(117-1)E

Figure 5-6 (Sheet 1 of 23)



EXTERNAL STORES LIMITATIONS WITHOUT CFT *(Continued)*

WEIGHTS INCLUDE
SUSPENSION EQUIPMENT

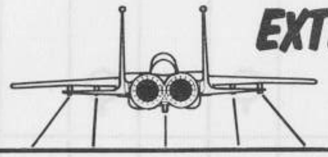
NA – NOT APPLICABLE
NE – NOT ESTABLISHED
BAL – BASIC AIRCRAFT LIMITS

STORE	LINE NUMBER	STATION LOADING AND SUSPENSION					MAXIMUM KCAS OR IMN WHICHEVER IS LESS			ACCELERATION–G				MAX DIVE FOR DEL	STORES CONFIGURATION WEIGHT LBS	REMARKS
										CARRIAGE						
		1	2	5	8	9	CARRIAGE	EMPLOY-MENT	JETTISON	SYM	UNSYM	EMPLOY-MENT	JETTISON			
610 Gallon Fuel Tank (McDonnell or Nestable Sargent-Fletcher)	1			○			660 1.5 ①	NA	660 1.5 ②	BAL	BAL	NA	+0.5 to +2.0	NA	EMPTY 616 FULL 4581	① Above 20,000 feet, empty tank is authorized to 800 knots/1.8M. Above 660 knots/1.5M, OWS information is invalid. ② Emergency, combat, or simultaneous selective jettison of wing stores prohibited above 600 knots. Below 600 knots, simultaneous jettison may produce pitch transients. ③ Tanks only ④ Single pod authorized on station 2 or 8. CAUTION Review Prohibited Manuvers.
	2		○		○		660 1.5								EMPTY 1330 FULL 9260	
	3		○	○	○										EMPTY 1946 FULL 13,841	
MXU-648/A Cargo Pod	4			●			500 0.95	NA	NA	0.0 to +3.0	0.0 to +2.0	NA	NA	NA	EMPTY 394 FULL 694	
	5		● ④		● ④										EMPTY 886 FULL 1486	
	6		●	●	●										EMPTY 1280 FULL 2180	
610 Gallon Fuel Tank and MXU-648/A Cargo Pod	7		● ④	○	● ④		500 0.95	NA	500 0.95 ③	0.0 to +3.0	0.0 to +2.0	NA	+0.5 to +2.0 ③	NA	EMPTY 1502 FULL 6067	
	8		○	●	○										EMPTY 1724 FULL 9854	
AN/ASQ-T11 or AN/ASQ-T13 Pod	9		● ⑤⑥ ⑦		†		BAL	NA	1.0 ⑧	BAL	BAL	NA	+0.5 to +2.0 ⑧	NA	1158	⑤ Only one pod required but may be loaded on any AIM-9 station. ⑥ T11 pod may be carried with any AIM-9 missile ⑦ T13 pod may be carried only with AIM-9L/M missile. ⑧ Jettison limit is for pylon jettison only

NOTE: AN/ASQ-T11, -T13 pod may be carried with any combination loading on stations 2, 5, & 8.

15A-1-(117-2)E

Figure 5-6 (Sheet 2)



EXTERNAL STORES LIMITATIONS WITHOUT CFT *(Continued)*

WEIGHTS INCLUDE
SUSPENSION EQUIPMENT

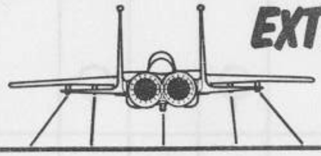
NA – NOT APPLICABLE
NE – NOT ESTABLISHED
BAL – BASIC AIRCRAFT LIMITS

STORE	LINE NUMBER	STATION LOADING AND SUSPENSION					MAXIMUM KCAS OR IMN WHICHEVER IS LESS			ACCELERATION-G				MAX DIVE FOR DEL	STORES CONFIGURATION WEIGHT LBS	REMARKS
		1	2	5	8	9	CARRIAGE	EMPLOY-MENT	JETTISON	CARRIAGE SYM	CARRIAGE UNSYM	EMPLOY-MENT	JETTISON			
SUU-20B/A Dispenser with BDU-33B/B or -33D/B	1			●			550 1.0	550 1.0	450 0.9 ①③	-2.0 to +6.5	-1.0 to +4.0	+0.5 to +5.0	+1.0 to +2.0 ①③	60°	EMPTY 572 FULL 714	① Jettison of SUU-20B/A Dispenser permitted only with pylon attached. ② Emergency, combat or simultaneous selective jettison of wing stores prohibited above 600 knots. Below 600 knots, simultaneous jettison may produce pitch transients. ③ Jettison limit is for store plus pylon. For jettison of store only, use employment limits. ④ Single store authorized on station 2 or 8.
	2		● ④		● ④										EMPTY 1242 FULL 1526	
	3		●	●	●										EMPTY 1814 FULL 2240	
610 Gallon Fuel Tank and SUU-20B/A Dispenser with BDU-33B/B or -33D/B	4		● ④	○	● ④		550 1.0	550 1.0	450 0.9 ①③	-2.0 to +6.5	-1.0 to +4.0	+0.5 to +5.0	+1.0 to +2.0 ①③	60°	EMPTY 1858 FULL 6107	CAUTION Review Prohibited Maneuvers.
	5		○	●	○										EMPTY 1902 FULL 9974	
MK 84 LDGP Bomb	6			●			700 1.4	700 1.4	600 1.4 ②③	+7.33	+5.86	+0.5 to +7.33	+0.5 to +2.0 ③	60°	2266	
	7		●		●										4630	
	8		●	●	●										6896	
610 Gallon Fuel Tank and MK-84 LDGP Bomb	9		●	○	●		660 1.4	660 1.4	600 1.4 ②③	+7.33	+5.86	+0.5 to +7.33	+0.5 to +2.0 ③	60°	EMPTY 5246 FULL 9211	
	10		○	●	○										EMPTY 3596 FULL 11,526	

15A-1-(117-3)E

Figure 5-6 (Sheet 3)

EXTERNAL STORES LIMITATIONS WITHOUT CFT *(Continued)*



WEIGHTS INCLUDE
SUSPENSION EQUIPMENT

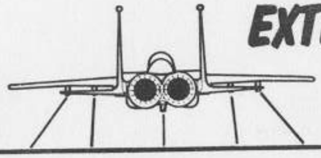
NA – NOT APPLICABLE
NE – NOT ESTABLISHED
BAL – BASIC AIRCRAFT LIMITS

STORE	LINE NUMBER	STATION LOADING AND SUSPENSION					MAXIMUM KCAS OR IMN WHICHEVER IS LESS			ACCELERATION–G				MAX DIVE FOR DEL	STORES CONFIGURATION WEIGHT LBS	REMARKS
										CARRIAGE						
		1	2	5	8	9	CARRIAGE	EMPLOY-MENT	JETTISON	SYM	UNSYM	EMPLOY-MENT	JETTISON			
BSU 50/B Bomb Low Drag	1			●			700 1.4	600 0.95	600 1.4 ①②	+7.33	+5.86	+0.5 to +7.33	+0.5 to +2.0 ②	60°	2304	① Emergency, combat or simultaneous selective jettison of wing stores prohibited above 600 knots. Below 600 knots, simultaneous jettison may produce pitch transients. ② Jettison limit is for store plus pylon. For jettison of store only, use employment limits. CAUTION Review Prohibited Manuevers.
	2		●		●										4706	
	3		●	●	●										7010	
610 Gallon Fuel Tank and BSU 50/B Bomb Low Drag	4		●	○	●		660 1.4	600 0.95	600 1.4 ①②	+7.33	+5.86	+0.5 to +7.33	+0.5 to +2.0 ②	60°	EMPTY 5322 FULL 9287	
	5		○	●	○										EMPTY 3634 FULL 11,564	
BSU 50/B Bomb High Drag	6			●			700 1.4	600 0.95	600 1.4 ①②	+7.33	+5.86	+0.5 to +7.33	+0.5 to +2.0 ②	35°	2304	
	7		●		●										4706	
	8		●	●	●										7010	
610 Gallon Fuel Tank and BSU 50/B Bomb High Drag	9		●	○	●		660 1.4	600 0.95	600 1.4 ①②	+7.33	+5.86	+0.5 to +7.33	+0.5 to +2.0 ②	35°	EMPTY 5322 FULL 9287	
	10		○	●	○										EMPTY 3634 FULL 11,564	

15A-1-(117-4)D

Figure 5-6 (Sheet 4)

EXTERNAL STORES LIMITATIONS WITHOUT CFT *(Continued)*



WEIGHTS INCLUDE
SUSPENSION EQUIPMENT

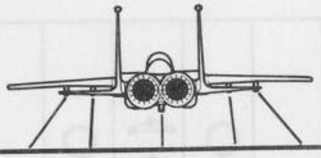
NA – NOT APPLICABLE
NE – NOT ESTABLISHED
BAL – BASIC AIRCRAFT LIMITS

STORE	LINE NUMBER	STATION LOADING AND SUSPENSION					MAXIMUM KCAS OR IMN WHICHEVER IS LESS			ACCELERATION–G				MAX DIVE FOR DEL	STORES CONFIGURATION WEIGHT LBS	REMARKS
		1	2	5	8	9	CARRIAGE	EMPLOY-MENT	JETTISON	CARRIAGE		EMPLOY-MENT	JETTISON			
										SYM	UNSYM					
GBU–10/B, –10A/B Bomb	1			●			700 1.4	700 1.4	600 1.4 ① ②	+7.33	+5.86	+0.5 to +7.33	+0.5 to +2.0 ②	60°	2349	① Emergency, combat or simultaneous selective jettison of wing stores prohibited above 600 knots. Below 600 knots, simultaneous jettison may product pitch transients. ② Jettison limit is for store plus pylon. For jettison of store only, use employment limits CAUTION Review Prohibited Maneuvers.
	2		●		●										4796	
	3		●	●	●										7145	
610 Gallon Fuel Tank and GBU–10/B –10A/B	4		●	○	●		660 1.4	660 1.4	600 1.4 ① ②	+7.33	+5.86	+0.5 to +7.33	+0.5 to +2.0 ②	60°	EMPTY 5412 FULL 9337	
	5		○	●	○										EMPTY 3679 FULL 11,609	
AN/ALQ 119(V)–12 ECM Pod	6			● ②			BAL	NA	NA ③	+7.33	+5.86	NA	NA ③	NA	876	① Emergency, combat or simultaneous selective jettison of wing stores prohibited above 600 knots. Below 600 knots, simultaneous jettison may product pitch transients. ② Carriage of AN/ALQ 119(V)–12, –14 ECM Pod is cleared only with SUU–60/A pylon modified by TCTO 16WG–25–501 ③ Jettison of ECM Pod is prohibited CAUTION Review Prohibited Maneuvers.
610 Gallon Fuel Tank and AN/ALQ 119(V)–12 ECM Pod	7		○	● ②	○		660 1.5	NA	660 1.5 ① ③	+7.33	+5.86	NA	+0.5 to +2.0 ③	NA	EMPTY 2206 FULL 10,136	
AN/ALQ 119(V)–14 ECM Pod	8			● ②			BAL	NA	NA ③	+7.33	+5.86	NA	NA ③	NA	702	
610 Gallon Fuel Tank and AN/ALQ 119(V)–14 ECM Pod	9		○	● ②	○		660 1.5	NA	660 1.5 ① ③	+7.33	+5.86	NA	+0.5 to +2.0 ③	NA	EMPTY 2032 FULL 9962	

15A–1–(117–5)D

Figure 5-6 (Sheet 5)

EXTERNAL STORES LIMITATIONS WITHOUT CFT *(Continued)*



WEIGHTS INCLUDE
SUSPENSION EQUIPMENT

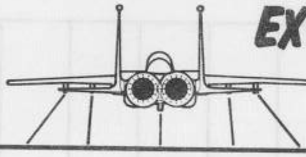
NA – NOT APPLICABLE
NE – NOT ESTABLISHED
BAL – BASIC AIRCRAFT LIMITS

STORE	LINE NUMBER	STATION LOADING AND SUSPENSION					MAXIMUM KCAS OR IMN WHICHEVER IS LESS			ACCELERATION–G				MAX DIVE FOR DEL	STORES CONFIGURATION WEIGHT LBS	REMARKS
		1	2	5	8	9	CARRIAGE	EMPLOY-MENT	JETTISON	CARRIAGE SYM	CARRIAGE UNSYM	EMPLOY-MENT	JETTISON			
AN/ALQ-131(V) Terminal Threat Pod (Deep Config.)	1			●			450 0.8 ②	NA	NA ③	+5.0 ②	+3.5 ②	NA	NA ③	NA	955	① Emergency, combat or simultaneous selective jettison of wing stores prohibited above 600 knots. Below 600 knots, simultaneous jettison may produce pitch transients.
610 Gallon Fuel Tank And AN/ALQ-131(V) Thermal Threat Pod (Deep Config.)	2		○	●	○		450 0.8 ②	NA	450 0.8 ① ② ③	+5.0 ②	+3.5 ②	NA	+0.5 To +2.0 ③	NA	Empty 2285 Full 10,215	② This limit will be in effect until the improved forward receiver radome is installed on the POD. ③ Jettison of ELM POD is prohibited. **CAUTION** **Review prohibited maneuvers.**
A/A 37U-36 Aerial Gunnery Target Set (AGTS-36) And 610 Gallon Fuel Tanks	3		○	● ●	○		⑤	⑤	150 to 500 0.95 ④	⑤	⑤	⑤	+0.5 to +2.0 ④	NA	Empty 2430 Full 10,064	④ Emergency jettison authorized for AGTS-36 and centerline pylon only. No selective jettison of AGTS-36 system allowed. ⑤ See A/A 37U-36 performance limitations table.

15A-1-(117-5.1)G

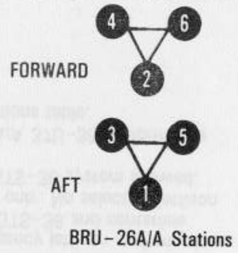
Figure 5-6 (Sheet 5A)

EXTERNAL STORES LIMITATIONS WITHOUT CFT *(Continued)*



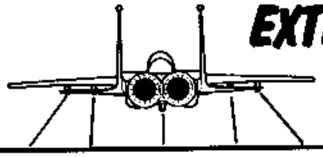
WEIGHTS INCLUDE
SUSPENSION EQUIPMENT

NA – NOT APPLICABLE
NE – NOT ESTABLISHED
BAL – BASIC AIRCRAFT LIMITS

STORE	LINE NUMBER	STATION LOADING AND SUSPENSION					MAXIMUM KCAS OR IMN WHICHEVER IS LESS			ACCELERATION–G				MAX DIVE FOR DEL	STORES CONFIGURATION WEIGHT LBS	REMARKS
		1	2	5	8	9	CARRIAGE	EMPLOY-MENT	JETTISON	CARRIAGE		EMPLOY-MENT	JETTISON			
										SYM	UNSYM					
BRU–26A/A Multiple Ejector Rack Empty	1			▽ ▽			BAL	NA	700 2.0 ①②	BAL	BAL	NA	+0.5 to +2.0 ②	NA	819	 4 6 FORWARD 2 3 5 AFT 1 BRU–26A/A Stations
	2		▽ ▽		▽ ▽										1736	
	3		▽ ▽	▽ ▽	▽ ▽										2555	
610 Gallon Fuel Tank and BRU–26A/A Multiple Ejector Rack Empty	4		▽ ▽	○	▽ ▽		660 1.5	NA	660 1.5 ①②	BAL	BAL	NA	+0.5 to +2.0 ②	NA	EMPTY 2352 FULL 6317	① Emergency, combat or simultaneous selective jettison of wing stores prohibited above 600 knots. Below 600 knots, simultaneous jettison may produce pitch transients. ② Jettison limit is for rack or pylon jettison. For jettison of store only, use employment limit.
	5		○	▽ ▽	○										EMPTY 2149 FULL 10,079	
BDU–33B/B or D/B Bomb Dummy Unit	6			⋎ ⋎			700 1.4	700 1.4 ③④	700 1.4 ①②	BAL	BAL	+0.5 to +7.33 ③④	+0.5 to +2.0 ②	60°	957	③ Bank angle release prohibited.
	7		⋎ ⋎		⋎ ⋎										2012	④ Minimum release interval from an originally fully loaded rack is 60 msec. For a rack not originally fully loaded, minimum release interval is 70 msec.
	8		⋎ ⋎	⋎ ⋎	⋎ ⋎										2969	
610 Gallon Fuel Tank and BDU–33B/B or D/B Bomb Dummy Unit	9		⋎ ⋎	○	⋎ ⋎		660 1.4	660 1.4 ③④	660 1.4 ①②	BAL	BAL	+0.5 to +7.33 ③④	+0.5 to +2.0 ②	60°	EMPTY 2628 FULL 6593	CAUTION Review Prohibited Maneuvers.
	10		○	⋎ ⋎	○										EMPTY 2287 FULL 10,217	

15A–1–(117–6)G

Figure 5-6 (Sheet 6)



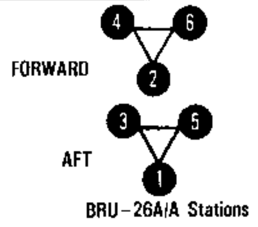
EXTERNAL STORES LIMITATIONS WITHOUT CFT *(Continued)*

WEIGHTS INCLUDE
SUSPENSION EQUIPMENT

NA – NOT APPLICABLE
NE – NOT ESTABLISHED
BAL – BASIC AIRCRAFT LIMITS

STORE	LINE NUMBER	STATION LOADING AND SUSPENSION					MAXIMUM KCAS OR IMN WHICHEVER IS LESS			ACCELERATION-G				MAX DIVE FOR DEL	STORES CONFIGURATION WEIGHT LBS
										CARRIAGE					
		1	2	5	8	9	CARRIAGE	EMPLOY-MENT	JETTISON	SYM	UNSYM	EMPLOY-MENT	JETTISON		
MK 20 MOD 3, 4 Bomb	1			∵ ∵			600 1.2	600 1.2 ③④	600 1.2 ①②	-2.0 to +5.5	ABOVE 1.0M 0.0 to +4.5 BELOW 1.0M -1.0 to +4.5	+0.5 to +5.5	+0.5 to +2.0 ②	60°	3735
	2		∵ ∵		∵ ∵										7568
	3		∵ ∵	∵ ∵	∵ ∵			600 0.98 ③④							11,303
	4		⋱ ⋱	∵ ∵	⋰ ⋰			600 1.2 ③④							9359
610 Gallon Fuel Tank and MK 20 MOD 3, 4 Bomb	5		∵ ∵	○	∵ ∵		600 1.2	600 1.2 ③④	600 1.2 ①②	-2.0 to +5.5		+0.5 to +5.5	+0.5 to +2.0 ②	60°	EMPTY 8184 FULL 12,149
	6		○	∵ ∵	○										EMPTY 5065 FULL 12,995
MK 82 LDGP Bomb and BDU-50/B Bomb	7			∵ ∵			700 1.4	700 1.4 ③④	700 1.4 ①②	BAL	BAL	+0.5 to +7.33	+0.5 to +2.0 ②	60°	3849
	8		∵ ∵		∵ ∵			600 1.15 ③④							7796
	9		∵ ∵	∵ ∵	∵ ∵			600 0.98 ③④ ⑤							11,645
	10		⋱ ⋱	∵ ∵	⋰ ⋰			600 1.15 ③④							9625
610 Gallon Fuel Tank and MK 82 LDGP Bomb	11		∵ ∵	○	∵ ∵		660 1.4	600 1.15 ③④	660 1.4 ①②	BAL	BAL	+0.5 to +7.33	+0.5 to +2.0 ②	60°	EMPTY 8952 FULL 12,917
	12		○	∵ ∵	○			660 1.4 ③④							EMPTY 5449 FULL 13,379

REMARKS



BRU-26A/A Stations

① Emergency, combat or simultaneous selective jettison of wing stores prohibited above 600 knots. Below 600 knots, simultaneous jettison may produce pitch transients.

② Jettison limit is for rack or pylon jettison. For jettison of store only, use employment limit.

③ Bank angle release prohibited.

④ Minimum release interval from an originally fully loaded rack is 60 msec. For a rack not originally fully loaded, minimum release interval is 70 msec.

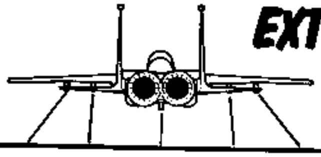
⑤ Simultaneous release from stations 5 and 8. In all other cases, limit is 600 knots/1.15 Mach

CAUTION

Review Prohibited Maneuvers.

15A-1-(117-7)F

Figure 5-6 (Sheet 7)



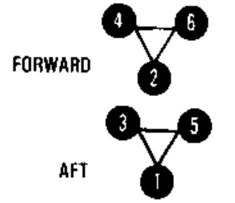
EXTERNAL STORES LIMITATIONS WITHOUT CFT *(Continued)*

WEIGHTS INCLUDE
SUSPENSION EQUIPMENT

NA – NOT APPLICABLE
NE – NOT ESTABLISHED
BAL – BASIC AIRCRAFT LIMITS

STORE	LINE NUMBER	STATION LOADING AND SUSPENSION					MAXIMUM KCAS OR IMN WHICHEVER IS LESS			ACCELERATION–G				MAX DIVE FOR DEL	STORES CONFIGURATION WEIGHT LBS
										CARRIAGE					
		1	2	5	8	9	CARRIAGE	EMPLOY-MENT	JETTISON	SYM	UNSYM	EMPLOY-MENT	JETTISON		
MK 82 SNAKEYE I Bomb Low Drag	1			▽ ▽			700 1.4 ⑦⑧	700 1.4 ③④	700 1.4 ①②	BAL	BAL	+0.5 to +7.33 ③④	+0.5 to +2.0 ②	60°	4119
	2		▽ ▽		▽ ▽			650 1.15 ③④							8336
	3		▽ ▽	▽ ▽	▽ ▽			600 0.98 ③④							12,455
	4		▽ ▽	▽ ▽	▽ ▽			650 1.2 ③④							10,255
610 Gallon Fuel Tank and MK 82 SNAKEYE I Bomb Low Drag	5		▽ ▽	○	▽ ▽		660 1.4 ⑦⑧	600 1.15 ③④	660 1.4 ①②	BAL	BAL	+0.5 to +7.33 ③④	+0.5 to +2.0 ②	60°	EMPTY 8412 FULL 12,377
	6		○	▽ ▽	○			660 1.4 ③④							EMPTY 5179 FULL 13,109
MK 82 SNAKEYE I Bomb High Drag	7			▽ ▽			700 1.4 ⑦⑧	500 0.85 ③⑤ ⑥⑨	700 1.4 ①②	BAL	BAL	+0.5 to +7.33 ③⑤ ⑨	+0.5 to +2.0 ②	30°	4119
	8		▽ ▽		▽ ▽										8336
	9		▽ ▽	▽ ▽	▽ ▽										12,455
610 Gallon Fuel Tank and MK 82 SNAKEYE I Bomb High Drag	10		▽ ▽	○	▽ ▽		660 1.4 ⑦⑧	500 0.85 ③⑤ ⑥⑨	660 1.4 ①②	BAL	BAL	+0.5 to +7.33 ③⑤ ⑨	+0.5 to +2.0 ②	30°	EMPTY 8412 FULL 12,377
	11		○	▽ ▽	○										EMPTY 5179 FULL 13,109

REMARKS



BRU–26A/A Stations

① Emergency, combat or simultaneous selective jettison of wing stores prohibited above 600 knots. Below 600 knots, simultaneous jettison may produce pitch transients.

② Jettison limit is for rack or pylon jettison. For jettison of store only, use employment limit.

③ Bank angle release prohibited.

④ Minimum release interval from an originally fully loaded rack is 60 msec. For a rack not originally fully loaded, minimum release interval is 70 msec.

⑤ Minimum release interval from same rack is 200 msec.

⑥ Simultaneous release from 2 stations. In all other cases, limit is 650 knots/1.2 Mach.

⑦ Mk 15 Mod 4 fins authorized.

⑧ Pilot option of armed high/low drag prohibited.

⑨ Expect substantial vibration during ripple release of wing stores at high speed.

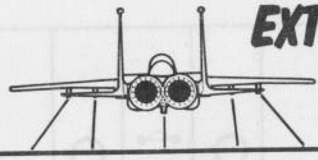
CAUTION

Review Prohibited Maneuves.

15A-1-(117-8)D

Figure 5-6 (Sheet 8)

EXTERNAL STORES LIMITATIONS WITHOUT CFT *(Continued)*

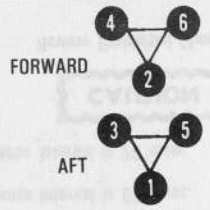


WEIGHTS INCLUDE
SUSPENSION EQUIPMENT

NA – NOT APPLICABLE
NE – NOT ESTABLISHED
BAL – BASIC AIRCRAFT LIMITS

STORE	LINE NUMBER	STATION LOADING AND SUSPENSION					MAXIMUM KCAS OR IMN WHICHEVER IS LESS			ACCELERATION–G				MAX DIVE FOR DEL	STORES CONFIGURATION WEIGHT LBS
							CARRIAGE	EMPLOY-MENT	JETTISON	CARRIAGE		EMPLOY-MENT	JETTISON		
		1	2	5	8	9				SYM	UNSYM				
BSU–49/B Bomb Low Drag	1			▽ ▽			700 1.4 ⑦	550 0.95 ③④	700 1.4 ①②	+7.33	+5.86	+0.5 to +7.33 ③④	+0.5 to +2.0 ②	60°	4119
	2		▽ ▽		▽ ▽										8336
	3		▽ ▽	▽ ▽	▽ ▽										12,455
610 Gallon Fuel Tank and BSU–49/B Bomb Low Drag	4		▽ ▽	○	▽ ▽		660 1.4 ⑦	550 0.95 ③④	660 1.4 ①②	+7.33	+5.86	+0.5 to +7.33 ③④	+0.5 to +2.0 ②	60°	EMPTY 8412 FULL 12,377
	5		○	▽ ▽	○										EMPTY 5179 FULL 13,109
BSU–49/B Bomb High Drag	6			▽ ▽			700 1.4 ⑦	500 0.85 ③⑤⑥⑧	700 1.4 ①②	+7.33	+5.86	+0.5 to +7.33 ③⑤⑧	+0.5 to +2.0 ②	35°	4119
	7		▽ ▽		▽ ▽										8336
	8		▽ ▽	▽ ▽	▽ ▽										12,455
610 Gallon Fuel Tank and BSU–49/B Bomb High Drag	9		▽ ▽	○	▽ ▽		660 1.4 ⑦	500 0.85 ③⑤⑥⑧	660 1.4 ①②	+7.33	+5.86	+0.5 to +7.33 ③⑤⑧	+0.5 to +2.0 ②	35°	EMPTY 8412 FULL 12,377
	10		○	▽ ▽	○										EMPTY 5179 FULL 13,109

REMARKS



BRU–26A/A Stations

① Emergency, combat or simultaneous selective jettison of wing stores prohibited above 600 knots. Below 600 knots, simultaneous jettison may produce pitch transients.

② Jettison limit is for rack or pylon jettison. For jettison of store only, use employment limit.

③ Bank angle release prohibited.

④ Minimum release interval from an originally fully loaded rack is 60 msec. For a rack not originally fully loaded, minimum release interval is 70 msec.

⑤ Minimum release interval from same rack is 200 msec.

⑥ Simultaneous release from 2 stations. In all other cases, limit is 650 knots/1.2 Mach.

⑦ Pilot option of armed high/low drag prohibited.

⑧ Expect substantial vibration during ripple release of wing stores at high speed.

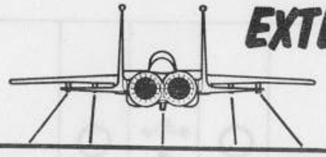
CAUTION

Review Prohibited Maneuvers.

15A–1–(117–9)D

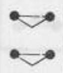
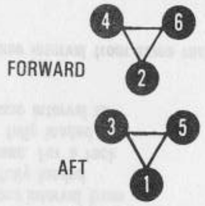
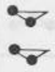
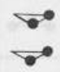
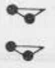
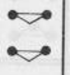
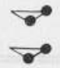
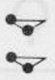
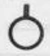
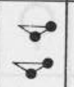
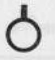
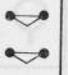
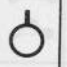
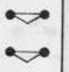
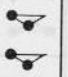
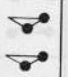
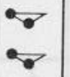
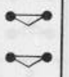
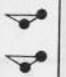
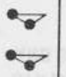
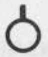
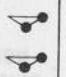
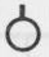
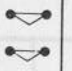
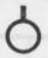
Figure 5-6 (Sheet 9)

EXTERNAL STORES LIMITATIONS WITHOUT CFT *(Continued)*



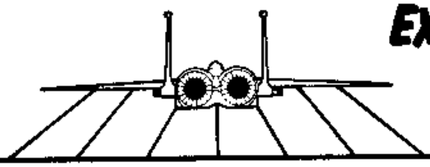
WEIGHTS INCLUDE
SUSPENSION EQUIPMENT

NA – NOT APPLICABLE
NE – NOT ESTABLISHED
BAL – BASIC AIRCRAFT LIMITS

STORE	LINE NUMBER	STATION LOADING AND SUSPENSION					MAXIMUM KCAS OR IMN WHICHEVER IS LESS			ACCELERATION–G				MAX DIVE FOR DEL	STORES CONFIGURATION WEIGHT LBS	REMARKS
		1	2	5	8	9	CARRIAGE	EMPLOY-MENT	JETTISON	CARRIAGE		EMPLOY-MENT	JETTISON			
										SYM	UNSYM					
CBU–52B/B Dispenser	1						600 1.2	600 1.2 ③④	600 1.2 ①②	–2.0 to +6.0	–1.0 to +5.0	+0.5 to +6.0	+0.5 to +2.0 ②	60°	3959	 FORWARD AFT BRU–26A/A Stations ① Emergency, combat or simultaneous selective jettison of wing stores prohibited above 600 knots. Below 600 knots, simultaneous jettison may produce pitch transients. ② Jettison limits are for rack or pylon jettison. Jettison limit for munition is employment limit. ③ Bank angle release prohibited. ④ Minimum release interval is 60 msec. ⑤ Minimum release interval is 70 msec. **CAUTION** Review Prohibited Maneuvers.
	2							600 1.05 ③⑤							8016	
	3														11,975	
610 Gallon Fuel Tank and CBU–52B/B Dispenser	4						600 1.2	600 1.05 ③⑤	600 1.2 ①②	–2.0 to +6.0	–1.0 to +5.0	+0.5 to +6.0	+0.5 to +2.0 ②	60°	EMPTY 8632 FULL 12,597	
	5							600 1.2 ③④							EMPTY 5289 FULL 13,219	
CBU–58/B CBU–71/B Dispensers	6						600 1.2	600 1.2 ③④	600 1.2 ①②	–2.0 to +6.0	–1.0 to +5.0	+0.5 to +6.0	+0.5 to +2.0	60°	4059	
	7							600 1.05 ③⑤							8216	
	8														12,275	
610 Gallon Fuel Tank and CBU–58/B, CBU–71/B Dispensers	9						600 1.2	600 1.05 ③⑤	600 1.2 ①②	–2.0 to +6.0	–1.0 to +5.0	+0.5 to +2.0	+0.5 to +2.0 ②	60°	EMPTY 8832 FULL 12,797	
	10							600 1.2 ③④							EMPTY 5389 FULL 13,319	

15A–1–(117–10)

Figure 5-6 (Sheet 10)



EXTERNAL STORES LIMITATIONS WITH CFT *(Continued)*

WEIGHTS INCLUDE
SUSPENSION EQUIPMENT

NA – NOT APPLICABLE
NE – NOT ESTABLISHED
BAL – BASIC AIRCRAFT LIMITS

STORE	LINE NUMBER	STATION LOADING AND SUSPENSION							MAXIMUM KCAS OR IMN WHICHEVER IS LESS			ACCELERATION–G				MAX DIVE FOR DEL	STORES CONFIGURATION WEIGHT LBS	REMARKS
												CARRIAGE						
		1	2	CFT L/H	5	CFT R/H	8	9	CARRIAGE	EMPLOY-MENT	JETTISON	SYM	UNSYM	EMPLOY-MENT	JETTISON			
AIM-9P AIM-9P-1 Missiles	1		✱|✱ ①② ③④				✱|✱ ①② ③④		700 2.0	700 2.0	1.0 ⑤⑦	BAL	BAL	-0.5 to +7.33	+0.5 to +2.0 ⑤⑦	NA	1586 ⑥	① Combined carriage between line numbers 1, 2, & 3 is prohibited. ② Adapters without launchers authorized if covers installed. ③ USAF approved dacron cord fix to prevent rolleron uncaging is mandatory on AIM-9P series missiles. ④ Wings without rollerons, guide vanes dampers, and cager assemblies may be used on the ATM-9L-4 training missile if all four wings have these parts removed. ⑤ Jettison limit is for pylon jettison only. ⑥ Subtract 690 pounds from stores configuration weight and 6.6 from total drag index if other inboard pylon mounted stores are loaded. ⑦ Jettison prohibited with forward AIM-7 missiles aboard.
AIM-9P-2 AIM-9P-3 Missiles	2																1626 ⑥	
AIM-9L ATM-9L-4 AIM-9M Missiles	3																1678 ⑥	
AIM-7F AIM-7M Missiles	4			3C FWD ✱	4C AFT ✱	6C AFT ✱	7C FWD ✱		700 2.0 ⑧	150 TO 700 2.0	1.0 ⑨	BAL	BAL	-0.5 to +7.33	+0.5 to +3.0 ⑨	NA	2040	⑧ Carriage of dummy training missile prohibited ⑨ Jettison between 250-350 knots, 1g, when tanks or AG weapons on stations 2 & 8.
SUU-60/A C_L Pylon	5				|				BAL	NA	700 1.4	BAL	BAL	NA	+0.5 to +2.0	NA	296	
SUU-59/A Inboard Pylon	6		|				|		BAL	NA	1.0	BAL	BAL	NA	+0.5 to +2.0	NA	690	
SUU-60/A SUU-59/A	7		|		|		|		BAL	NA	1.0	BAL	BAL	NA	+0.5 to +2.0	NA	986	

MISSILE STATIONS

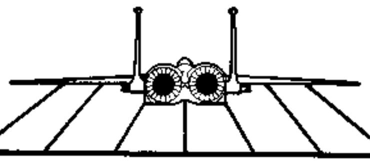
	3C	4C	6C	7C
FWD	✱			✱
AFT		✱	✱	

NOTE: AIM-9 series missiles may be carried with any combination loading on stations 2, 5, & 8.

NOTE: AIM-7 series missiles may be carried with any combination loading on stations 2, 5, & 8, except with inboard stores on multiple ejector rack on stations 2 or 8.

15A-1-(117-11)E

Figure 5-6 (Sheet 11)



EXTERNAL STORES LIMITATIONS WITH CFT *(Continued)*

WEIGHTS INCLUDE
SUSPENSION EQUIPMENT

NA – NOT APPLICABLE
NE – NOT ESTABLISHED
BAL – BASIC AIRCRAFT LIMITS

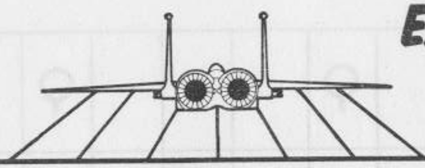
STORE	LINE NUMBER	STATION LOADING AND SUSPENSION							MAXIMUM KCAS OR IMN WHICHEVER IS LESS			ACCELERATION–G				MAX DIVE FOR DEL	STORES CONFIGURATION WEIGHT LBS	REMARKS
												CARRIAGE						
		1	2	CFT L/H	5	CFT R/H	8	9	CARRIAGE	EMPLOY-MENT	JETTISON	SYM	UNSYM	EMPLOY-MENT	JETTISON			
610 Gallon Fuel Tank (McDonnell or Nestable Sargent-Fletcher)	1				○				660 1.5	NA	660 1.5 ①	BAL	BAL	NA	+0.5 to +2.0	NA	EMPTY 616 FULL 4581	① Emergency, combat, or simultaneous selective jettison of wing stores prohibited above 600 knots. Below 600 knots, simultaneous jettison may produce pitch transients. ② Tanks only ③ 300 knots for jettison of tank plus pylon from stations 2 & 8 with aft AIM-7 missiles aboard. ④ Single pod authorized on station 2 or 8. CAUTION Review Prohibited Maneuvers.
	2		○				○				660 1.5 ①③						EMPTY 1330 FULL 9260	
	3		○		○		○										EMPTY 1946 FULL 13,841	
MXU-648/A Cargo Pod	4				●				500 0.9	NA	NA	0.0 to +3.0	0.0 to +2.0	NA	NA	NA	EMPTY 394 FULL 694	
	5		● ④				● ④										EMPTY 886 FULL 1486	
	6		●		●		●										EMPTY 1280 FULL 2180	
610 Gallon Fuel Tank and MXU-648/A Cargo Pod	7		● ④		○		● ④		500 0.9	NA	500 0.9 ②	0.0 to +3.0	0.0 to +2.0	NA	+0.5 to +2.0 ②	NA	EMPTY 1502 FULL 6067	
	8		○		●		○				500 0.9 ②③						EMPTY 1724 FULL 9954	
AN/ASQ-T11 or AN/ASQ-T13 Pod	9		●+ ⑤⑥ ⑦				+		700 2.0	NA	NE ⑧⑨	BAL	BAL	NA	NE ⑧⑨	NA	1158	⑤ Only one pod required but may be loaded on any AIM-9 station. ⑥ T11 pod may be carried with any AIM-9 missile. ⑦ T13 pod may be carried only with AIM-9L/M missiles. ⑧ Jettison limit is for pylon jettison only. ⑨ Jettison prohibited when mounted on inboard side of pylon with AIM-7 missile aboard.

NOTE: AN/ASQ-T11, -T13 pod may be carried with any combination loading on stations 2, 5, & 8.

15A-1-(117-12)E

Figure 5-6 (Sheet 12)

EXTERNAL STORES LIMITATIONS WITH CFT *(Continued)*



WEIGHTS INCLUDE
SUSPENSION EQUIPMENT

NA – NOT APPLICABLE
NE – NOT ESTABLISHED
BAL – BASIC AIRCRAFT LIMITS

STORE	LINE NUMBER	STATION LOADING AND SUSPENSION							MAXIMUM KCAS OR IMN WHICHEVER IS LESS			ACCELERATION–G				MAX DIVE FOR DEL	STORES CONFIGURATION WEIGHT LBS
		1	2	CFT L/H	5	CFT R/H	8	9	CARRIAGE	EMPLOY-MENT	JETTISON	CARRIAGE SYM	CARRIAGE UNSYM	EMPLOY-MENT	JETTISON		
SUU–20B/A Dispenser with BDU–33B/B or –33D/B	1				●				550 1.0	550 1.0	450 0.9 ①	–2.0 to +6.5	–1.0 to +4.0	+0.5 to +5.0	+1.0 to +2.0 ①③		EMPTY 572 FULL 714
	2		● ⑦				● ⑦				450 0.9 ①⑤						EMPTY 1242 FULL 1526
	3		●		●		●										EMPTY 1814 FULL 2240
610 Gallon Fuel Tank and SUU–20B/A Dispenser with BDU–33B/B or –33D/B	4		● ⑦		○		● ⑦		550 1.0	550 1.0	450 0.9 ①⑤	–2.0 to +6.5	–1.0 to +4.0	+0.5 to +5.0	+1.0 to +2.0 ①③	60°	EMPTY 1858 FULL 6107
	5		○		●		○				450 0.9 ①④						EMPTY 1902 FULL 9974
MK 84 LDGP Bomb	6				●				700 1.4	700 1.4	600 1.4 ②③	+7.33	+5.86	+0.5 to +7.33	+0.5 to +2.0 ③	60°	2266
	7		●				●			700 1.4 ⑥	600 1.4 ②③ ⑤						4630
	8		●		●		●										6896
610 Gallon Fuel Tank and MK 84 LDGP Bomb	9		●		○		●		660 1.4	660 1.4	600 1.4 ②③ ⑤	+7.33	+5.86	+0.5 to +7.33	+0.5 to +2.0 ③	60°	EMPTY 5246 FULL 9211
	10		○		●		○			660 1.4	600 1.4 ②③ ④						EMPTY 3596 FULL 11,526

REMARKS

① Jettison of SUU–20B/A Dispenser permitted only with pylon attached.

② Emergency, combat or simultaneous selective jettison of wing stores prohibited above 600 knots. Below 600 knots, simultaneous jettison may produce pitch transients.

③ Jettison limit is for store plus pylon. For jettison of store only, use employment limits

④ 300 knots for jettison of tank plus pylon from stations 2 & 8 with aft AIM–7 missiles aboard.

⑤ 400 knots for jettison of bomb plus pylon from stations 2 & 8 with aft AIM-7 missiles aboard.

⑥ Employment from stations 2 & 8 prohibited with aft AIM–7 missiles aboard.

⑦ Single store authorized on station 2 or 8.

CAUTION

Review Prohibited Maneuvers.

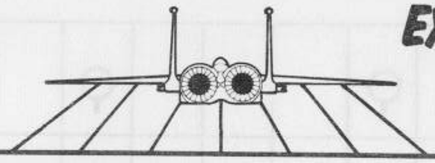
15A–1–(117–13)E

Figure 5-6 (Sheet 13)

EXTERNAL STORES LIMITATIONS WITH CFT *(Continued)*

WEIGHTS INCLUDE
SUSPENSION EQUIPMENT

NA – NOT APPLICABLE
NE – NOT ESTABLISHED
BAL – BASIC AIRCRAFT LIMITS

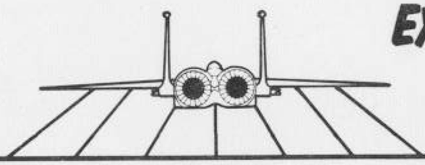


STORE	LINE NUMBER	STATION LOADING AND SUSPENSION: 1	2	CFT L/H	5	CFT R/H	8	9	MAXIMUM KCAS OR IMN WHICHEVER IS LESS: CARRIAGE	EMPLOY-MENT	JETTISON	ACCELERATION–G: CARRIAGE SYM	CARRIAGE UNSYM	EMPLOY-MENT	JETTISON	MAX DIVE FOR DEL	STORES CONFIGURATION WEIGHT LBS	REMARKS
BSU–50/B Bomb Low Drag	1				●				700 1.4	600 0.95	600 1.4 ①②	+7.33	+5.86	+0.5 to +7.33	+0.5 to +2.0 ②	60°	2034	① Emergency,combat or simultaneous selective jettison of wing stores prohibited above 600 knots. Below 600 knots, simultaneous jettison may produce pitch transients. ② Jettison limit is for store plus pylon. For jettison of store only, use employment limits ③ 300 knots for jettison of tank plus pylon from stations 2 & 8 with aft AIM–7 missiles aboard. ④ 400 knots for jettison of bomb plus pylon from stations 2 & 8 with aft AIM-7 missiles aboard. CAUTION Review Prohibited Maneuvers.
	2		●				●				600 1.4 ①② ④						4706	
	3		●		●		●										7010	
610 Gallon Fuel Tank and BSU–50/B Bomb Low Drag	4		●		○		●		660 1.4	600 0.95	600 1.4 ①② ④	+7.33	+5.86	+0.5 to +7.33	+0.5 to +2.0 ②	60°	EMPTY 5322 FULL 9287	
	5		○		●		○				600 1.4 ①② ③						EMPTY 3634 FULL 11,564	
MK84 BSU–50/B Bomb High Drag	6				●				700 1.4	600 0.95	600 1.4 ①②	+7.33	+5.86	+0.5 to +7.33	+0.5 to +2.0 ②	35°	2304	
	7		●				●				600 1.4 ①② ④						4706	
	8		●		●		●										7010	
610 Gallon Fuel Tank and BSU–50/B Bomb High Drag	9		●		○		●		660 1.4	600 0.95	600 1.4 ①② ④	+7.33	+5.86	+0.5 to +7.33	+0.5 to +2.0 ②	35°	EMPTY 5322 FULL 9287	
	10		○		●		○				600 1.4 ①② ③						EMPTY 3634 FULL 11,564	

15A-1-(117-14)D

Figure 5-6 (Sheet 14)

EXTERNAL STORES LIMITATIONS WITH CFT *(Continued)*



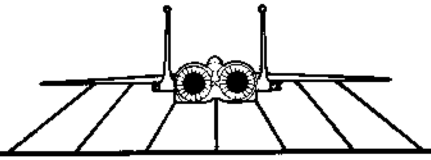
WEIGHTS INCLUDE
SUSPENSION EQUIPMENT

NA – NOT APPLICABLE
NE – NOT ESTABLISHED
BAL – BASIC AIRCRAFT LIMITS

STORE	LINE NUMBER	STATION LOADING AND SUSPENSION							MAXIMUM KCAS OR IMN WHICHEVER IS LESS			ACCELERATION–G				MAX DIVE FOR DEL	STORES CONFIGURATION WEIGHT LBS	REMARKS
		1	2	CFT L/H	5	CFT R/H	8	9	CARRIAGE	EMPLOY-MENT	JETTISON	CARRIAGE SYM	CARRIAGE UNSYM	EMPLOY-MENT	JETTISON			
GBU–10/B –10A/B Bomb	1				●				700 1.4	700 1.4	600 1.4 ①②	+7.33	+5.86	+0.5 to +7.33	+0.5 to +2.0 ②	60°	2349	① Emergency, combat or simultaneous selective jettison of wing stores prohibited above 600 knots. Below 600 knots, simultaneous jettison may produce pitch transients. ② Jettison limit is for store plus pylon. For jettison of store only, use employment limits ③ 300 knots for jettison of tank plus pylon from stations 2 & 8 with aft AIM–7 missiles aboard. ④ 400 knots for jettison of bomb plus pylon from stations 2 & 8 with aft AIM-7 missiles aboard. CAUTION Review Prohibited Maneuvers.
	2		●				●				600 1.4 ①② ④						4796	
	3		●		●		●										7145	
610 Gallon Fuel Tank and GBU–10/B –10A/B Bomb	4		●		○		●		660 1.4	660 1.4	600 1.4 ①② ④	+7.33	+5.86	+0.5 to +7.33	+0.5 to +2.0 ②	60°	EMPTY 5892 FULL 9857	
	5		○		●		○				600 1.4 ①② ③						EMPTY 3919 FULL 11,849	
AN/ALQ 119(V)–12 ECM Pod	6				● ②				700 2.0	NA	NA ③	+7.33	+5.86	NA	NA ③	NA	876	① Emergency, combat or simultaneous selective jettison of wing stores prohibited above 600 knots. Below 600 knots, simultaneous jettison may produce pitch transients. ② Carriage of AN/ALQ 119(V)–12, –14 ECM Pod is cleared only with SUU–60/A pylon modified by TCTO 16WG–25–501 ③ Jettison of ECM Pod is prohibited ④ 300 knots for jettison of tank plus pylon from stations 2 & 8 with aft AIM–7 missiles aboard. CAUTION Review Prohibited Maneuvers.
610 Gallon Fuel Tank and AN/ALQ 119(V)–12 ECM Pod	7		○		● ②		○		660 1.5	NA	660 1.5 ①③ ④	+7.33	+5.86	NA	+0.5 to +2.0 ③	NA	EMPTY 2206 FULL 10,136	
AN/ALQ 119(V)–14 ECM Pod	8				● ②				700 2.0	NA	NA ③	+7.33	+5.86	NA	NA ③	NA	702	
610 gallon Fuel Tank and AN/ALQ 119(V)–14 ECM Pod	9		○		● ②		○		660 1.5	NA	660 1.5 ①③ ④	+7.33	+5.86	NA	+0.5 to +2.0 ③	NA	EMPTY 2032 FULL 9962	

15A–1–(117–15)

Figure 5-6 (Sheet 15)



EXTERNAL STORES LIMITATIONS WITH CFT *(Continued)*

WEIGHTS INCLUDE
SUSPENSION EQUIPMENT

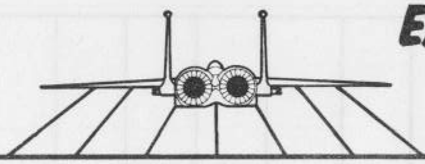
NA – NOT APPLICABLE
NE – NOT ESTABLISHED
BAL – BASIC AIRCRAFT LIMITS

STORE	LINE NUMBER	STATION LOADING AND SUSPENSION							MAXIMUM KCAS OR IMN WHICHEVER IS LESS			ACCELERATION–G				MAX DIVE FOR DEL	STORES CONFIGURATION WEIGHT LBS	REMARKS
		1	2	CFT L/H	5	CFT R/H	8	9	CARRIAGE	EMPLOY-MENT	JETTISON	CARRIAGE		EMPLOY-MENT	JETTISON			
												SYM	UNSYM					
AN/ALQ-131(V) Terminal threat pod (Deep Config.)					●				450 0.8 ②	NA	NA	+5.0 ②	+3.5 ②	NA	NA	NA	955	① Emergency combat or simultaneous selective jettison of wing stores prohibited above 600 knots. Below 600 knots, simultaneous jettison may produce pitch transients. ② This limit will be in effect until the improved forward receive radome is installed on the POD. ③ Jettison of ECM POD is prohibited. CAUTION Review prohibited maneuvers.
610 Gallon Fuel Tank And AN/ALQ-131(V) Terminal threat Pod (Deep Config.)			○		●		○		450 0.8 ②	NA	450 0.8 ① ② ③	+5.0 ②	+3.5 ②	NA	+0.5 To +2.0 ③	NA	Empty 2285 Full 10,215	

15A-1-(117-15.1F

Figure 5-6 (Sheet 15A)

EXTERNAL STORES LIMITATIONS WITH CFT *(Continued)*

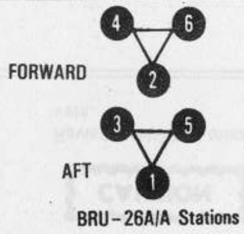


WEIGHTS INCLUDE
SUSPENSION EQUIPMENT

NA – NOT APPLICABLE
NE – NOT ESTABLISHED
BAL – BASIC AIRCRAFT LIMITS

STORE	LINE NUMBER	STATION LOADING AND SUSPENSION 1	2	CFT L/H	5	CFT R/H	8	9	MAXIMUM KCAS OR IMN WHICHEVER IS LESS CARRIAGE	EMPLOY-MENT	JETTISON	ACCELERATION-G CARRIAGE SYM	UNSYM	EMPLOY-MENT	JETTISON	MAX DIVE FOR DEL	STORES CONFIGURATION WEIGHT LBS
BRU-26A/A Multiple Ejector Rack Empty	1				▽ ▽				700 2.0	NA	375 0.9 ②	BAL	BAL	NA	+1.0 ②	NA	819
	2		▽ ▽				▽ ▽										1736
	3		▽ ▽		▽ ▽		▽ ▽										2555
610 Gallon Fuel Tank and BRU-26A/A Multiple Ejector Rack Empty	4		▽ ▽		○		▽ ▽		660 1.5	NA	375 0.9 ①	BAL	BAL	NA	+1.0 ②		EMPTY 2352 FULL 6317
	5		○		▽ ▽		○				375 0.9 ①② ⑤						EMPTY 2149 FULL 10,079
BDU-33B/B or -33 D/B Bomb Dummy Unit	6				▼ ▼				700 1.4	550 0.95 ③④	375 0.9 ①②	+7.33	+5.86	+0.5 to +7.33 ③④	+0.5 to +2.0 ②	60°	957
	7		▼ ▼	⑥		⑥	▼ ▼										2012
	8		▼ ▼	⑥	▼ ▼	⑥	▼ ▼										2969
610 Gallon Fuel Tank and BDU-33B/B or -33D/B Bomb Dummy Unit	9		▼ ▼	⑥	○	⑥	▼ ▼		660 1.4	550 0.95 ③④	375 0.9 ①②	+7.33	+5.86	+0.5 to +7.33 ③④	+0.5 to +2.0 ②	60°	EMPTY 2628 FULL 6593
	10		○		▼ ▼		○				375 0.9 ①② ⑤						EMPTY 2287 FULL 10,217

REMARKS



BRU-26A/A Stations

① Emergency, combat or simultaneous selective jettison of wing stores prohibited above 600 knots. Below 600 knots, simultaneous jettison may produce pitch transients.

② Jettison limit is for rack or pylon jettison. For jettison of store only, use employment limit.

③ Bank angle release prohibited.

④ Minimum release interval from an originally fully loaded rack is 60 msec. For a rack not originally fully loaded, minimum release interval is 70 msec.

⑤ 300 knots for jettison of tank plus pylon from stations 2 & 8 with aft AIM-7 missiles aboard.

⑥ Carriage of AIM-7 on CFT is prohibited when BRU-26A/A inboard stations loaded.

CAUTION

Review Prohibited Maneuvers.

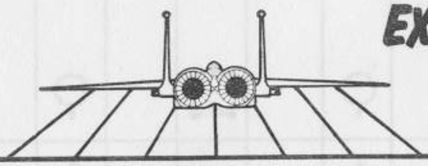
15A-1-(117-16)D

Figure 5-6 (Sheet 16)

EXTERNAL STORES LIMITATIONS WITH CFT *(Continued)*

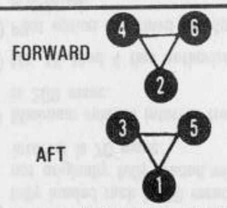
WEIGHTS INCLUDE
SUSPENSION EQUIPMENT

NA – NOT APPLICABLE
NE – NOT ESTABLISHED
BAL – BASIC AIRCRAFT LIMITS



STORE	LINE NUMBER	STATION LOADING AND SUSPENSION 1	2	CFT L/H	5	CFT R/H	8	9	MAXIMUM KCAS OR IMN WHICHEVER IS LESS: CARRIAGE	EMPLOY-MENT	JETTISON	ACCELERATION–G CARRIAGE SYM	UNSYM	EMPLOY-MENT	JETTISON	MAX DIVE FOR DEL	STORES CONFIGURATION WEIGHT LBS
MK 20 MOD 3, 4 Bomb	1				▼▼				600 1.2	550 0.95 ③④ ⑦	375 0.9 ①②	−2.0 to +5.5	−1.0 to +4.5	+0.5 to +5.5	+1.0 ②	60°	3735
	2		▼▼	⑥		⑥	▼▼										7568
	3		▼▼	⑥	▼▼	⑥	▼▼										11,303
610 Gallon Fuel Tank and MK 20 MOD 3, 4 Bomb	4		▼▼	⑥	○	⑥	▼▼		600 1.2	550 0.95 ③④ ⑦	375 0.9 ①②	−2.0 to +5.5	−1.0 to +4.5	+0.5 to +5.5	+1.0 ②	60°	EMPTY 8184 FULL 12,149
	5		○		▼▼		○				375 0.9 ①② ⑤						EMPTY 5065 FULL 12,995
MK 82 LDGP Bomb and BDU-50/B Bomb	6				▼▼				700 1.4	550 0.95 ③④	375 0.9 ①②	+7.33	+5.86	+0.5 to +7.33	+1.0 ②	60°	3849
	7		▼▼	⑥		⑥	▼▼										7796
	8		▼▼	⑥	▼▼	⑥	▼▼										11,645
610 Gallon Fuel Tank and MK 82 LDGP Bomb	9		▼▼	⑥	○	⑥	▼▼		660 1.4	550 0.95 ③④	375 0.9 ①②	+7.33	+5.86	+0.5 to +7.33	+1.0 ②	60°	EMPTY 8952 FULL 12,917
	10		○		▼▼		○				375 0.9 ①② ⑤						EMPTY 5449 FULL 13,379

REMARKS



BRU–26A/A Stations

① Emergency, combat or simultaneous selective jettison of wing stores prohibited above 600 knots. Below 600 knots, simultaneous jettison may produce pitch transients.

② Jettison limit is for rack or pylon jettison. For jettison of store only, use employment limit.

③ Bank angle release prohibited.

④ Minimum release interval from an originally fully loaded rack is 60 msec. For a rack not originally fully loaded, minimum release interval is 70 msec.

⑤ 300 knots for jettison of tank plus pylon from stations 2 & 8 with aft AIM–7 missiles aboard.

⑥ Carriage of AIM–7 on CFT is prohibited when BRU–26A/A inboard stations loaded.

⑦ Employment prohibited without local AD mod to nose impeller/tail fin restraining bands in place.

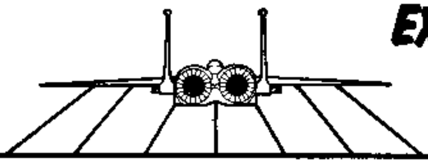
CAUTION

Review Prohibited Maneuvers.

15A-1-(117-17)F

Figure 5-6 (Sheet 17)

EXTERNAL STORES LIMITATIONS WITH CFT *(Continued)*

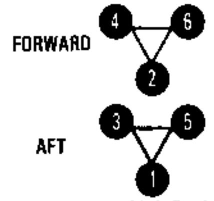


WEIGHTS INCLUDE
SUSPENSION EQUIPMENT

NA – NOT APPLICABLE
NE – NOT ESTABLISHED
BAL – BASIC AIRCRAFT LIMITS

STORE	LINE NUMBER	STATION LOADING AND SUSPENSION							MAXIMUM KCAS OR IMN WHICHEVER IS LESS			ACCELERATION–G				MAX DIVE FOR DEL	STORES CONFIGURATION WEIGHT LBS
		1	2	CFT L/H	5	CFT R/H	8	9	CARRIAGE	EMPLOY-MENT	JETTISON	CARRIAGE		EMPLOY-MENT	JETTISON		
												SYM	UNSYM				
MK 82 SNAKEYE I Bomb Low Drag	1				▽ ▽				700 1.4 ⑥⑦	550 0.95 ③④	375 0.9 ①②	+7.33	+5.86	+0.5 to +7.33 ③④	+1.0 ②	60°	4119
	2		▽ ▽	⑩		⑩	▽ ▽										8336
	3		▽ ▽	⑩	▽ ▽	⑩	▽ ▽										12,455
610 Gallon Fuel Tank and MK 82 SNAKEYE I Bomb Low Drag	4		▽ ▽	⑩	○	⑩	▽ ▽		660 1.4 ⑥⑦	550 0.95 ③④	375 0.9 ①②	+7.33	+5.86	+0.5 to +7.33 ③④	+1.0 ②	60°	EMPTY 8412 FULL 12,377
	5		○		▽ ▽		○				375 0.9 ①② ⑨						EMPTY 5179 FULL 13,109
MK 82 SNAKEYE I Bomb High Drag	6				▽ ▽				700 1.4 ⑥⑦	500 0.85 ③⑤ ⑧	375 0.9 ①②	+7.33	+5.86	+0.5 to +7.33 ③⑤ ⑧	+1.0 ②	35°	4119
	7		▽ ▽	⑩		⑩	▽ ▽										8336
	8		▽ ▽	⑩	▽ ▽	⑩	▽ ▽										12,455
610 Gallon Fuel Tank and MK 82 SNAKEYE I Bomb High Drag	9		▽ ▽	⑩	○	⑩	▽ ▽		660 1.4 ⑥⑦	500 0.85 ③⑤ ⑧	375 0.9 ①②	+7.33	+5.86	+0.5 to +7.33 ③⑤ ⑧	+1.0 ②	35°	EMPTY 8412 FULL 12,377
	10		○		▽ ▽		○				375 0.9 ①② ⑨						EMPTY 5179 FULL 13,109

REMARKS



BRU-26A/A Stations

① Emergency, combat or simultaneous selective jettison of wing stores prohibited above 600 knots. Below 600 knots, simultaneous jettison may produce pitch transients.

② Jettison limit is for rack or pylon jettison. For jettison of store only, use employment limit.

③ Bank angle release prohibited.

④ Minimum release interval from an originally fully loaded rack is 60 msec. For a rack not originally fully loaded, minimum release interval is 70 msec.

⑤ Minimum release interval from same rack is 200 msec.

⑥ MK 15 Mod 4 fins authorized.

⑦ Pilot option of armed high/low drag prohibited.

⑧ Expect substantial vibration during ripple release of wing stores at high speed.

⑨ 300 knots for jettison of tank plus pylon from stations 2 & 8 with aft AIM-7 missiles aboard.

⑩ Carriage of AIM-7 on CFT is prohibited when BRU-26A/A inboard stations loaded.

CAUTION

Review Prohibited Maneuvers.

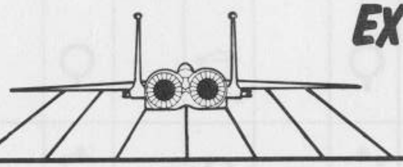
15A-1-(117-18)D

Figure 5-6 (Sheet 18)

EXTERNAL STORES LIMITATIONS WITH CFT *(Continued)*

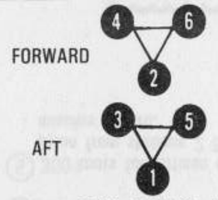
WEIGHTS INCLUDE
SUSPENSION EQUIPMENT

NA – NOT APPLICABLE
NE – NOT ESTABLISHED
BAL – BASIC AIRCRAFT LIMITS



STORE	LINE NUMBER	STATION LOADING AND SUSPENSION							MAXIMUM KCAS OR IMN WHICHEVER IS LESS			ACCELERATION–G				MAX DIVE FOR DEL	STORES CONFIGURATION WEIGHT LBS
		1	2	CFT L/H	5	CFT R/H	8	9	CARRIAGE	EMPLOY-MENT	JETTISON	CARRIAGE SYM	CARRIAGE UNSYM	EMPLOY-MENT	JETTISON		
BSU-49/B Bomb Low Drag	1				▼ ▼				700 1.4 ⑥	550 0.95 ③④	375 0.9 ①②	+7.33	+5.86	+0.5 to +7.33 ③④	+1.0 ②	60°	4119
	2		▼ ▼	⑨		⑨	▼ ▼										8336
	3			⑨	▼ ▼	⑨											12,455
610 Gallon Fuel Tank and BSU-49/B Bomb Low Drag	4		▼ ▼	⑨	○	⑨	▼ ▼		660 1.4 ⑥	550 0.95 ③④	375 0.9 ①②	+7.33	+5.86	+0.5 to +7.33 ③④	+1.0 ②	60°	EMPTY 8412 FULL 12,377
	5		○		▼ ▼		○				375 0.9 ①② ⑧						EMPTY 5179 FULL 13,109
BSU-49/B Bomb High Drag	6				▼ ▼				700 1.4 ⑥	500 0.85 ③④ ⑦	375 0.9 ①②	+7.33	+5.86	+0.5 to +7.33 ③④ ⑦	+1.0 ②	35°	4119
	7		▼ ▼	⑨		⑨	▼ ▼										8336
	8		▼ ▼	⑨	▼ ▼	⑨	▼ ▼										12,455
610 Gallon Fuel Tank and BSU-49/B Bomb High Drag	9		▼ ▼	⑨	○	⑨	▼ ▼		660 1.4 ⑥	500 0.85 ③④ ⑦	375 0.9 ①②	+7.33	+5.86	+0.5 to +7.33 ③④ ⑦	+1.0 ②	35°	EMPTY 8412 FULL 12,377
	10		○		▼ ▼		○				375 0.9 ①② ⑧						EMPTY 5179 FULL 13,109

REMARKS



BRU-26A/A Stations

① Emergency, combat or simultaneous selective jettison of wing stores prohibited above 600 knots. Below 600 knots, simultaneous jettison may produce pitch transients.

② Jettison limit is for rack or pylon jettison. For jettison of store only, use employment limit.

③ Bank angle release prohibited.

④ Minimum release interval from an originally fully loaded rack is 60 msec. For a rack not originally fully loaded, minimum release interval is 70 msec.

⑤ Minimum release interval from same rack is 200 msec.

⑥ Pilot option of armed high/low drag prohibited.

⑦ Expect substantial vibration during ripple release of wing stores at high speed.

⑧ 300 knots for jettison of tank plus pylon from stations 2 & 8 with aft AIM-7 missiles aboard.

⑨ Carriage of AIM-7 on CFT is prohibited when BRU-26A/A inboard stations loaded.

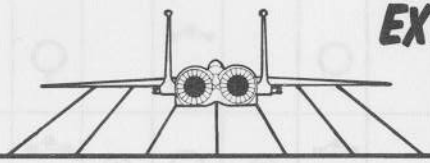
CAUTION

Review Prohibited Maneuvers.

15A-1-(117-19)D

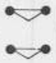
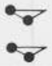
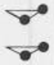
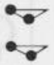
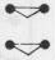
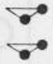
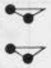
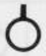
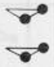
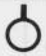
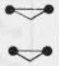
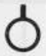
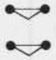
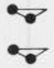
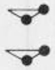
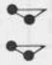
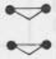
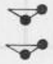
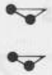
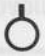
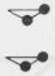
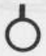
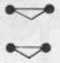
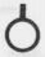
Figure 5-6 (Sheet 19)

EXTERNAL STORES LIMITATIONS WITH CFT *(Continued)*

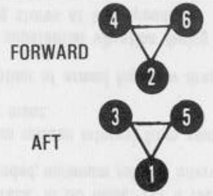


WEIGHTS INCLUDE
SUSPENSION EQUIPMENT

NA – NOT APPLICABLE
NE – NOT ESTABLISHED
BAL – BASIC AIRCRAFT LIMITS

STORE	LINE NUMBER	STATION LOADING AND SUSPENSION							MAXIMUM KCAS OR IMN WHICHEVER IS LESS			ACCELERATION–G				MAX DIVE FOR DEL	STORES CONFIGURATION WEIGHT LBS
												CARRIAGE					
		1	2	CFT L/H	5	CFT R/H	8	9	CARRIAGE	EMPLOY-MENT	JETTISON	SYM	UNSYM	EMPLOY-MENT	JETTISON		
CBU–52B/B Dispenser	1								600 1.2	550 0.95 ② ③	375 0.9 ①	–2.0 to +6.0	–1.0 to +5.0	+0.5 to +6.0	+1.0 ①	60°	3959
	2									550 0.95 ② ④							8016
	3																11,975
610 Gallon Fuel Tank and CBU–52B/B Dispenser	4								600 1.2	550 0.95 ② ④	375 0.9 ①	–2.0 to +6.0	–1.0 to +5.0	+0.5 to +6.0	+1.0 ①	60°	EMPTY 8632 FULL 12,597
	5									550 0.95 ② ③ ⑤							EMPTY 5289 FULL 13,219
CBU–58/B CBU–71/B Dispensers	6								600 1.2	550 0.95 ② ③	375 0.9 ①	–2.0 to +6.0	–1.0 to +5.0	+0.5 to +6.0	+1.0 ①	60°	4059
	7									550 0.95 ② ④							8216
	8																12,275
610 Gallon Fuel Tank and CBU–58/B CBU–71/B Dispensers	9								600 1.2	550 0.95 ② ④	375 0.9 ①	–2.0 to +6.0	–1.0 to +5.0	+0.5 to +6.0	+1.0 ①	60°	EMPTY 8832 FULL 12,797
	10									550 0.95 ② ③ ⑤							EMPTY 5389 FULL 13,319

REMARKS



BRU–26A/A Stations

① Jettison limits are for rack or pylon jettison. Jettison limit for munition is employment limit

② Bank angle release prohibited.

③ Minimum release interval is 60 msec.

④ Minimum release interval is 70 msec.

⑤ 300 knots for jettison of tank plus pylon from stations 2 & 8 with aft AIM–7 missiles aboard.

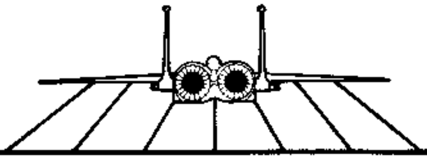
CAUTION

Review Prohibited Maneuvers.

15A–1–(117–20)D

Figure 5-6 (Sheet 20)

EXTERNAL STORES LIMITATIONS WITH CFT *(Continued)*



WEIGHTS INCLUDE
SUSPENSION EQUIPMENT

NA – NOT APPLICABLE
NE – NOT ESTABLISHED
BAL – BASIC AIRCRAFT LIMITS

STORE	LINE NUMBER	STATION LOADING AND SUSPENSION							MAXIMUM KCAS OR IMN WHICHEVER IS LESS			ACCELERATION–G				MAX DIVE FOR DEL	STORES CONFIGURATION WEIGHT LBS	REMARKS
												CARRIAGE						
		1	2	CFT L/H	5	CFT R/H	8	9	CARRIAGE	EMPLOY-MENT	JETTISON	SYM	UNSYM	EMPLOY-MENT	JETTISON			
A/A 37U-36 Aerial Gunnery Target Set (AGTS-36) And 610 Gallon Fuel Tanks	1		○		●		○		②	②	150 to 500 0.95 ①	②	②	②	+0.5 to +2.0 ①	NA	Empty 2430 Full 10,064	① Emergency jettison authorized for AGTS-36 and centerline pylon only. No selective jettison of AGTS-36 system allowed. ② See A/A 37U-36 performance limitations table.

15A-1-(117-21)G

Figure 5-6. (Sheet 21)

SECTION VI

FLIGHT CHARACTERISTICS

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Departure and SPIN 6-7
Autorolls 6-7
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Low-Altitude High-Speed Flight 6-9

HANDLING QUALITIES

GENERAL

The hydro-mechanical and CAS systems operate together to produce handling qualities which do not vary significantly throughout the flight envelope. Section I describes in detail the various components of the flight control system. This section discusses some of the resultant handling qualities and describes how they change with various failures.

HANDLING CHARACTERISTICS

Pitch CAS ON, Pitch Ratio AUTO

Pitch response to stick input does not vary appreciably with airspeed, altitude, engine power, or configuration change. There is no stick lightening (dig in) tendency as the aircraft decelerates through Mach 1, even at high g loading. In high altitude, high Mach number flight, stick forces increase slightly. Stick forces also increase at high angle of attack (AOA) to produce a natural "nose heaviness" near stall. Because of the automatic trim feature, the stick force required to maintain a desired g does not change with airspeed or configuration change. The automatic trim does not trim off control forces; you select a desired stick force by use of the manual trim. For example, if you trim for hands-off, 1 g level flight, the aircraft will tend to remain in 1 g level flight, regardless of thrust, airspeed, or configuration changes. There is some delay in the automatic trim function. This is particularly noticeable when rolling out of a turn. The nose will tend to rise, requiring some forward stick force, even if the aircraft was not trimmed in the turn. In this case, do not retrim immediately, since most of the nose-up tendency will disappear in a very short time.

Pitch CAS OFF, Pitch Ratio AUTO

The aircraft feels less solid in pitch (less pitch damping) and precise maneuvers, such as tracking and air refueling are more difficult. Slow to approximately 250 knots to improve handling qualities for air refueling. The automatic trim is less effective, causing larger trim transients during airspeed or configuration changes, or when rolling out of turns. Supersonic, above 600 knots, pitch control is very sensitive, and pilot induced oscillations (PIO) may occur. If this occurs, release the stick and reduce speed. Maximum stabilator available is slightly less at all speeds, resulting in higher stick forces at high g and less available g at full aft stick. At higher altitude, this reduction can be as much as 2 g. Below 10,000 feet, the reduction in available g is negligible. During takeoffs and landings, the nose feels heavier and some mild pitch oscillations may occur. Because of the reduced stabilator effectiveness, the nose cannot be raised as early during takeoff roll nor held up as long during landing. With three external fuel tanks installed, close formation and air refueling may be very difficult; and some tendencies toward mild pilot induced oscillation may occur. For aircraft before PTC Interlock Defeat modification (ECP 1758) with CFT's installed, if pitch CAS drops off above 0.75 Mach, a nose-up transient may occur. An additional nose-up transient may occur when decelerating through about 1.0 Mach and a nose-down transient may occur when decelerating through about 0.8 Mach.

Pitch CAS ON, Pitch Ratio EMERG

Very little degradation in handling qualities is noticeable. Maximum stabilator deflection is reduced at low speed. The greatest danger in this condition is the severely degraded handling qualities if pitch CAS drops off.

Pitch CAS OFF, Pitch Ratio EMERG

Stick forces are very high at low speed, and pitch control is very sensitive at high subsonic speed. Automatic trim is not available. Available AOA and g are severely reduced at both supersonic and low speed. During landing, stick forces are very high, pitch response is slow, and flare capability is greatly reduced. Maximum available AOA is approximately 21 units at touchdown speed. Control is adequate for landing, but avoid high sink rate at slow speed. An approach at 18 units AOA or less provides sufficient flare capability for landing.

LATERAL-DIRECTIONAL CHARACTERISTICS

Yaw and Roll CAS ON, Roll Ratio AUTO

Roll response to stick input does not vary appreciable throughout the flight envelope. Full lateral stick produces a high roll rate through most of the flight envelope. Continuous full-stick rolls can result in aircraft pitch and yaw excursions, which can cause high structural loads and possible loss of control due to inertial coupling. This tendency is greatest with negative or high positive g loads and above 550 knots or Mach 1.4. Lateral stick forces are light, and initial roll acceleration is high, particularly during low altitude, high speed subsonic flight. At these conditions, there is a tendency to overcontrol. The aileron-rudder interconnect (ARI), supplemented by CAS, permits all rolling maneuvers to be made with lateral stick only. No coordinating rudder is necessary, even at high AOA. When the stick is near full aft, lateral stick causes large rudder deflection in the direction of lateral input. With forward stick, the rudder deflection is opposite to lateral input. With gear down, full aileron is available at any stick position and coordinating rudder is maintained. The aircraft can be rolled using rudder; however, maximum roll rate can be achieved using only lateral stick at all AOA. At higher AOA, either rudder alone, lateral stick alone, or both together may be used to achieve the desired roll response.

Yaw and Roll CAS ON, Roll Ratio EMERG

Roll response will be slightly degraded at most flight conditions. Mechanical ARI is inoperative which results in some adverse yaw when rolling at high AOA. Lateral-directional control during landing will be slightly degraded, particularly in the presence of crosswind.

Yaw or Roll CAS OFF, Roll Ratio AUTO

Dutch roll (roll-yaw motion) damping is greatly reduced, particularly at approach speed. Roll can produce uncommanded yaw, especially at termination. Precise tracking is difficult. Initial roll acceleration is reduced, but maximum roll rate can be greater than with the CAS ON. The tendency to overcontrol in roll at high speed is reduced. The ARI is less effective. During landing, the airplane tends to wallow and some rudder may be necessary for coordinated flight.

Yaw or Roll CAS OFF, Roll Ratio EMERG

Roll rate is reduced at all speeds. Roll response is very sluggish, and stick forces are high, particularly at low speed. There is no ARI. Approach and landing in crosswind, turbulence, or with an asymmetric load is difficult.

External Stores

External stores (particularly the centerline tank only configuration) reduce aircraft stability. The centerline tank, by itself, reduces the lateral-directional stability while wing stores, with or without the centerline tank loaded, reduce the longitudinal stability. With the CAS on, there is little noticeable effect, particularly below 30 units AOA. With the CAS off, there is a noticeable increase in pitch sensitivity with external stores loaded. Loss of directional stability and subsequent rolling departures may be encountered when attempting high sideslip maneuvers (cross controls) even with CAS ON. These departures are preceded by an apparent increase in the sideslip with a constant rudder pedal input. Store inertia will affect roll response. More time is required to attain or stop a given roll rate, particularly at high AOA.

HEAVY GROSS WEIGHT

The aircraft exhibits no adverse handling qualities at maximum gross weight. In fact, the control system masks the weight effects to the point where the pilot can put the aircraft in a high AOA, high sink rate condition with little warning. This is particularly apparent during traffic patterns and landings. For this reason, a wide pattern or straight-in approach is recommended. Fly final approach at on speed AOA, but delay reducing power until well into the flare to prevent an excessive sink rate. Expect the nose to drop at a significantly higher airspeed during aerobraking.

STALLS

1 G STALLS

Light buffet begins at approximately 18 units AOA, increases in intensity to 23 units, then remains fairly constant. External stores decrease buffet onset AOA and increase the buffet level. Required aft stick force increases with increasing AOA (CAS On or Off). Some wing rock and yaw oscillation occurs above 30 units AOA. This is accentuated in the centerline tank configuration. With full aft stick, AOA stabilizes at 45 units or above with airspeed 100 knots or less (this varies with c.g. position, aft c.g. giving higher AOA). As AOA increases above 30 units, lateral stick becomes less effective in generating roll. The rudder is more effective than lateral stick for roll control approaching the stall. At stall (full aft stick) neither lateral stick nor rudder are very effective. The vertical velocity (cockpit gage) will probably be pegged going down. Recovery from a stall is immediate when the stick is moved forward. Lateral stick inputs should be removed before the stick is moved forward to recover from a stall or departures could be induced. Any sideslip present will induce a roll with forward stick motion.

ACCELERATED STALLS

Accelerated stall characteristics are heavy buffet with moderate yaw and roll oscillations averaging less than 10° of sideslip and 20° of bank. All buffet and yaw/roll activity diminishes rapidly with airspeed bleed-off. With external stores, buffet onset is earlier and buffet level is greater. Airspeed bleed-off tends to be more rapid.

NEGATIVE ANGLE-OF-ATTACK STALLS

In a level flight negative g stall, AOA is below zero units. The last few inches of forward stick travel does not increase AOA, and moving the stick back from the forward stop does not produce any response during the first few inches of stick motion. Positive aft stick force may be required to eliminate negative g and recover to normal flight. Negligible lateral or directional activity occurs at stall with no buffet. External stores have little effect.

LANDING CONFIGURATION STALLS

With gear and flaps down, stall characteristics are much the same as in the 1 g stall; however, buffet begins at about 23 units AOA. External stores decrease buffet onset AOA and increase buffet level. The roll and yaw motions, buffet, and indicated airspeed are similar to the 1 g stall. Any lateral control input above 35 units AOA can produce excessive adverse yaw rate (apparent flight control reversal), and a spin may rapidly develop.

FLIGHT WITH ASYMMETRIC LOADS

The aircraft will tend to turn into the heavy wing during takeoff roll. Since lateral stick away from the heavy wing is required to keep the wings level, any aft stick movement produces yaw away from the heavy wing (because of ARI action). Therefore, avoid abrupt pitch changes.

Although aerodynamic asymmetry has some drag effect, the primary source of degraded departure warning and resistance is weight asymmetry. The centerline tank only configuration further aggravates the condition due to the reduction of the lateral-directional stability. High AOA's, high subsonic Mach numbers, and higher altitudes tend to amplify the characteristics created by the asymmetry. However, the aircraft may be safely flown at 30 units AOA or below with an asymmetric load as great as one full external wing tank. Lateral asymmetries have a pronounced effect on roll performance above 30 units AOA in that little capability remains to roll into the heavy wing. If the critical AOA for a given asymmetric loading is exceeded, the aircraft will roll in the direction opposite the heavy wing. At higher AOA's, this roll rate can be quite rapid.

In addition to increased departure susceptibility, lateral asymmetry also degrades the recovery characteristics. As the asymmetry increases, the recovery is delayed. Control can be regained by reducing AOA and increasing speed.

Landing may be made with asymmetric loading if turns are shallow and a flat approach is flown. Fly final approach at on speed AOA but delay reducing power until well into the flare. Avoid a large or abrupt flare. With a large asymmetric load, avoid crosswinds over 15 knots. When in doubt, perform a controllability check before landing.

WEIGHT LIMITS

Lateral weight asymmetry is measured by summing the moments about the lateral center of gravity. Each moment is a product of the distance from the lateral c.g. in feet and the weight of the differential fuel or store in pounds. For example, a 650 pound internal wing fuel imbalance equals 5,000 foot-pounds (7.7 feet X 650 pounds). The airplane is very departure resistant below 5,000 foot-pounds of asymmetry. If you have two AIM-7's on one side and none on the other, you need only 200 pounds wing fuel difference to add up to 5,000 foot-pounds. Two AIM-7's and two AIM-9's on one side result in more than 7,000 foot-pounds asymmetry. The aircraft is spin resistant below 7,000 foot-pounds. Spin recovery has been demonstrated up to 10,000 foot-pounds of asymmetry. Figure 6-1 summarizes the preceding data.

DEPARTURE/SPIN SUSCEPTIBIILITY SUMMARY

Lateral Asymmetry (Foot Pounds)	Departure (All Loadings)	Spin	
		Without Centerline Tank	With Centerline Tank Only
0 to 5,000	Resistant	Extremely Resistant	Resistant
Greater than 5,000 (Less than 7,000)	Susceptible	Resistant	Resistant
7,000 to 10,000	Extremely Susceptible	Resistant	Susceptible

Notes: - This table applies to altitudes above approximately 20,000 feet.

- Departure resistance is increased considerably at lower altitudes.

- At 40 to 44 units AOA and 0.5 to 0.76 Mach number, departure resistance is decreased over that stated. The table presents the overall departure susceptibility, considering the low probability of remaining within this limited region of instability.

Figure 6-1

DEPARTURES

A departure from controlled flight is characterized by an uncommanded flight path change such as a nose slice, roll away from a lateral input, or excessive yaw rates, as in a spin whereas an out-of-control condition exists when the aircraft is not responding properly to pilot inputs. The initial presence of the yaw rate warning tone indicates a departed flight condition that, if not corrected immediately, may quickly transition to a spin.

Departures should not be encountered below 30 units AOA at any altitude, airspeed, or loading. The aircraft is resistant to departure at lower altitudes. Above 30 units AOA, external stores or asymmetry increases the departure susceptibility. The centerline tank only configuration further increases departure susceptibility which, if combined with lateral asymmetry, markedly increases the likelihood of departure. Due to the increased drag with three external tanks installed, significantly more altitude is required to attain flying speed during recovery from post stall gyrations than is required with only air-to-air missiles installed or clean. Jettison of stores is not recommended due to the possibility of stores-to-aircraft collision.

The aircraft exhibits a slightly reduced directional stability (yaw) in the 0.50 to 0.76 Mach and 40-44 units AOA region. In this region, departure resistance is decreased and spin susceptibility is increased. If controls are neutralized at the first indication of departure (large uncommanded roll or yaw), the aircraft will recover immediately. Even though the aircraft exhibits high directional stability, large lateral asymmetries can cause the aircraft to quickly enter a spin if not promptly recovered from a departure.

SYMMETRIC LOADS

Symmetrically loaded aircraft are only susceptible to departure in the region of reduced directional (yaw) stability, that is, 0.50 to 0.76 Mach and 40-44 units AOA. In the region of 40-44 units AOA directional stability is slightly reduced. A symmetrically loaded aircraft in this region will usually exhibit one or more classic signs of an impending stall, such as wing rock (it may only be one) or some yaw excursions. Departure may be characterized by a nose slice and a rolling departure. Departures with a centerline tank only configuration will be more abrupt and will exhibit higher yaw rates. Neutralizing the controls at departure, results in recovery, usually within one complete rotation in roll, with negligible altitude loss. It is possible to enter an autoroll during the recovery from a rolling departure. While the aircraft remains spin resistant, high yaw rates may be experienced before the aircraft settles into a low energy 1 g stall. It should be noted, that with a centerline tank only configuration loaded, introducing and holding full lateral stick at or near longitudinal center during the departure roll may cause spin entry in as little as three seconds. Vertical stall, tailslide, 1 g stall, or accelerated stall below 200 knots in the clean configuration show no tendency to spin if there is no lateral asymmetry.

ASYMMETRIC LOADS

Departure susceptibility is most affected by lateral c.g. position (internal wing fuel and/or stores, tanks, or missiles imbalance). Adequate lateral control and departure resistance exists up to 30 units AOA, with up to one full external wing fuel tank and one empty (36,200 foot-pounds of asymmetry). As AOA is increased above 30 units AOA, more lateral stick is required to hold up the heavy wing. This results in increasing sideslip (nose away from the heavy wing) due to reduced directional stability, rudder deflection through the ARI, and the proverse yawing moment (yaw in the direction of lateral stick input) caused by the aileron/differential stabilator deflections. If AOA continues to increase, the rudder is no longer able to reduce the sideslip into the heavy wing; and the aircraft will depart with a yaw and roll acceleration away from the heavy wing. At 40 units AOA or above, the yaw and roll accelerations cannot be controlled by lateral stick. If full aft stick is maintained during or after a 1 g stall or abrupt pull-up, the aircraft will depart (with the yaw rate tone as the first warning) with a very pronounced roll away from the heavy wing and a descending spiral is likely. Therefore, controls should be neutralized immediately following the stall/departure. In the region of reduced directional stability of 0.50 to 0.76 Mach and 40-44 units AOA, departures are inevitable with greater than 5,000 foot-pounds of asymmetry; and again, departure will be without warning. In summary, the aircraft is considered susceptible to departure with lateral asymmetries above 5,000 foot-pounds and extremely susceptible with greater than 7,000 foot-pounds.

Out-of-control/departed flight conditions with asymmetric loads will usually take longer to recover due to the higher yaw rates involved. With 7,000 to 10,000 foot-pounds of asymmetry, recovery may be significantly delayed, with several peaks in AOA and yaw rate and 1-1/2 to 2 rolls during the departure. Abrupt entries into high AOA regions will result in a departure and loss of control without warning. During slow entry rate approaches to stall with asymmetric loads (especially greater than 5,000 foot-pounds), the ever increasing amount of lateral stick or rudder to control heading and bank angle should serve as ample warning that loss of control is imminent. Controls must be neutralized immediately at departure to effect recovery. The most significant effect on recovery capability is the amount of time between departure and neutralized control. Longitudinally centered lateral stick against rotation in roll will result in a spin. Even though the aircraft exhibits a high directional stability, large lateral asymmetry can cause the aircraft to quickly enter a spin if not promptly recovered from a departure.

SPIN CHARACTERISTICS

SYMMETRIC LOADS

A laterally symmetric aircraft in the cruise configuration (i.e., gear and flaps up and speedbrake in) is extremely spin resistant with any combination of lateral-directional control inputs when aft stick is maintained. Full cross-controls at full aft stick over a wide range of speeds fails to achieve spins. The extreme spin resistance is a result of the basic high AOA stability and flight control system design. Full lateral control applied opposite to the direction of roll during an autoroll will result in a spin if the lateral stick input is prolonged. Following departure in a laterally symmetric aircraft, full lateral control inputs with the stick near the neutral position may cause a spin in as little as 3 seconds. With the centerline tank only configuration, full lateral control deflections applied opposite to the rotation following a departure can result in spins in even less time.

ASYMMETRIC LOADS

With lateral asymmetries of 5,000 foot-pounds or less, except for centerline tank only loading, there is no significant increase in spin susceptibility. When aft stick is maintained with any combination of lateral control inputs, the aircraft will remain extremely spin resistant. However, with AOA above 30 units, spins are attainable in as little as three seconds with lateral control inputs (no rudder required) against the rotation at departure. With the centerline tank only configuration, the aircraft is still spin resistant while maintaining aft stick at departure with up to 5,000 foot-pounds of asymmetry. With 5,000 foot-pounds of asymmetry, the aircraft with the centerline tank only configuration is closer to being considered spin susceptible when full lateral inputs are applied with the stick near neutral following a departure. Only 1 to 2 seconds may be required to develop a spin. Overall, the aircraft with 5,000 foot-pounds or less asymmetry is considered extremely spin resistant without a centerline tank and resistant with the tank. With the exception of the centerline tank only configuration, the aircraft is still spin resistant with asymmetries to 10,000 foot-pounds. The decreased spin resistance for asymmetries greater than 5,000 foot-pounds is due to the increasing rolling moment caused by the increased asymmetry. As asymmetry increases, the susceptibility to spin increases and neutralizing the controls must not be delayed.

SPIN MODES

Three different erect spin modes may be entered. The two most common are a highly oscillatory mode with medium yaw rates and a smooth flat spin with high yaw rates. The third mode, encountered very infrequently, is characterized by low yaw rates (approximately 60°/second) and mild oscillations.

The highly oscillatory spin mode will exhibit average AOA in excess of cockpit gage range (70-80 units), with average yaw rates of 60° to 90° per second. Oscillations of ±32 units AOA and ±20° per second yaw rate are typical. Neutralizing the controls during a highly oscillatory spin usually will result in a recovery in as little as 1 to 1-1/2 turns with an altitude loss of approximately 2,500 to 4,000 feet. However, with neutral controls, it may require as much as 3-1/2 turns and 7,000 feet to self-recover, or the spin could progress to a flat spin. Delaying recovery or inadvertently applying pro-spin controls may cause a flat spin. Applying aileron in the direction of the spin will recover the aircraft almost immediately and prevent flat spin entry in all cases. Application of aileron opposite the spin direction (i.e., pro-spin) will accelerate the yaw, and a flat spin can develop rapidly. Characteristics of the highly oscillatory spin are not significantly different for various symmetric loadings, altitudes, gross weights, c.g.'s or power settings.

The flat spin mode with symmetric loadings will exhibit average AOA in excess of cockpit gage range (70-90 units), with average yaw rates of 75° to 135° per second. Periods of high (i.e., 3 to 4 g) negative "eyeballs out" longitudinal g forces are experienced. These spins are uncomfortable and disorienting due to high yaw rates and g forces. The flat spin is often very steady with no oscillations apparent to the pilot; however, in some cases, mild oscillations may be present. When a flat spin has developed, recovery is no longer possible with neutral controls. Nearly full aileron/differential stabilator deflections in the spin direction are required for recovery. Rudder deflections in either direction have little effect on spin recovery. Recovery will not be immediately apparent and will require approximately two or four turns, with at least 3,000 to 6,000 feet of altitude loss (approximately 10 to 20 seconds) to stop the rotation. Full aileron deflection, which is required for satisfactory recovery, is made available by the spin recovery mode of the flight control system. This mode allows the pilot to use full aileron deflection regardless of fore and aft stick position when yaw rate is above 60°/second. Also full aileron deflection is available with the stick at longitudinal neutral regardless of yaw rate. Yaw rate reduction (i.e. recovery), is smooth and quite slow, and may not be apparent for some time. With application of aileron opposite the spin direction (i.e., pro-spin), the yaw rate will accelerate and "eyeballs out" g force may reach 4 to 5 g. With the aileron again applied in the direction of the spin (anti-spin), recovery will be even slower due to increased yaw rate. For asymmetric loadings (i.e., 5,000-7,000 foot-pounds), turns to recover from the smooth spin will increase by 1 to 1-1/2 turns, with an additional altitude loss of 1,000 to 2,000 feet when compared to symmetric loadings.

INVERTED SPINS

The inverted spin can be caused by full lateral stick or full rudder deflection at the full forward stick position (i.e., inverted stall). The spin direction is in the direction of rudder deflection. The inverted spin is generally stabilized at −55 to −60 units AOA, with 40° to 45° per second yaw rate. No buffet or roll/yaw oscillations exist. After neutralizing the controls, the aircraft will recover from the spin in approximately 1-1/2 turns, with 4,000 feet altitude loss.

ENGINE OPERATION DURING DEPARTURE AND SPIN

Engine stagnation requiring shutdown and restart is possible in an out-of-control maneuver. Dual engine stagnation has occurred during extremely violent, forced departure. Engine stagnation has also occurred when very slow airspeed/high AOA has resulted in AB blowout and engine stall. No engine anomaly has occurred during stall, vertical stall or tailslide at MIL or IDLE throttle setting.

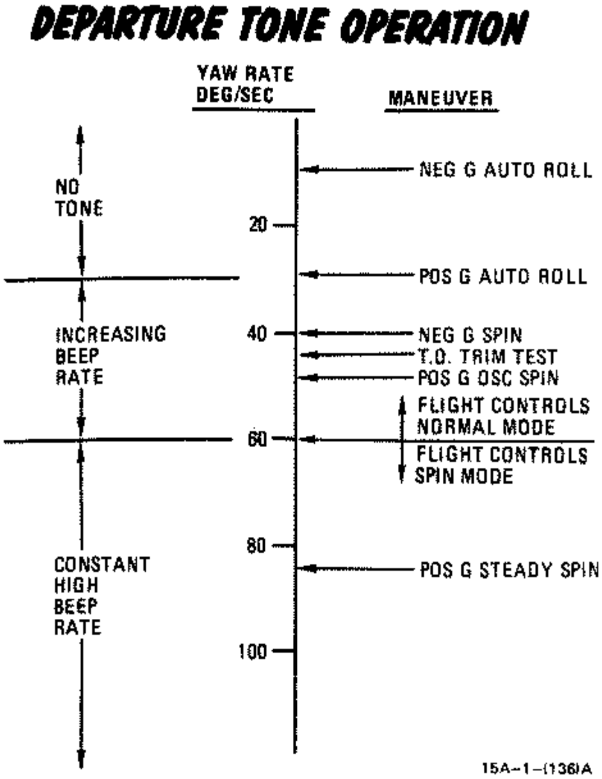

Figure 6-2

AUTOROLLS

An autoroll is a sustained combination of rolling and yawing motion which continues after controls are neutralized. The rolling and yawing motion is sustained by a residual rudder surface deflection and inertial coupling. An autoroll differs from a spin in that it is primarily a rolling maneuver with a small yaw rate and AOA of 20 to 25 units.

Typical autoroll entry conditions are: 200 to 300 knots, 20 to 30 units AOA, rolling with rudder alone and then easing the stick forward. It can be terminated by applying rudder against the roll. A negative g autoroll can be terminated by neutralizing the controls. The wing is not stalled during an autoroll.

POSITIVE G AUTOROLLS

During a positive g autoroll, roll and yaw will be in the same direction. The turn needle will fluctuate from side to side and cannot be used to determine direction. The roll direction should be obvious; however, if in doubt, use the ADI. The departure warning may or may not sound since the yaw rate will be slightly above or below 30°/sec, the point at which beeping begins. The roll will terminate when rudder is applied. The more rudder applied, the faster the recovery. When the roll stops, a negative g pitch over will occur. The severity of the negative g pitch over is a function of the rate of recovery and is worse if pitch CAS is off. To minimize negative g pitch over and aid in pilot orientation, slowly apply rudder to the deflection required to stop the roll. Aileron against the roll in an autoroll is a pro spin input and, if prolonged, will induce a spin.

NEGATIVE G AUTOROLLS

During negative g autorolls, yaw and roll will be in opposite directions. Negative g autorolls are normally entered at negative g and sustained by maintaining forward stick. A negative g autoroll normally exhibits slow roll and yaw rates, and the departure warning tone will not sound. Neutralizing the controls is sufficient to terminate the maneuver. Neutral controls and rudder application with the rolling motion will speed the recovery. If the stick was significantly forward during entry, considerable aft stick may be required to reduce the negative g during both the maneuver and recovery. Negative g autorolls can be extremely disorienting because of negative g's.

SLOW SPEED FLIGHT

The aircraft exhibits no unusual slow speed flight characteristics. For a symmetrically loaded airplane (i.e., no weight asymmetry), the handling qualities remain acceptable up to the point where there is insufficient airflow over the controls and wings to provide control power or lift. Aggravated control inputs will not cause serious problems due to the basic design of the control system. In many cases at very slow speed, full aft stick and/or a pegged vertical velocity may be the only sign(s) of a low energy 1 g stalled condition.

For an asymmetrically loaded aircraft (i.e., weight asymmetry), the handling qualities still are acceptable; but the departure resistance is reduced.

NEGATIVE G FLIGHT CHARACTERISTICS

Aircraft response to roll and yaw control inputs at negative load factors can be extremely disorienting. Abrupt rudder or cross controls can result in pilot induced out-of-control situations.

During negative g maneuvers, pitch rates increase rapidly with decreasing load factor including negative g. Large aileron inputs cause the aircraft to roll out from under you with the disorienting and uncomfortable effect of being thrown up around the side mirror.

Rudder response varies with AOA and under negative g, can produce adverse effects. At positive g, left rudder produces left wing down roll. However, as positive g is reduced, rudder input produces more and more yaw induced side-slip and has less effect on generating roll. As angle of attack becomes negative (between 0 and −0.5g) rudder input produces all sideslip and no roll. Large rudder input will result in extreme sideslip angle and the aircraft will be flying sideways, resulting in high cockpit lateral g's. At load factors more negative than about −0.5g, rudder will cause a roll in the opposite direction and will be accompanied by high pitch rate and pitch angle changes. This condition is extremely disorienting due to the combined effect of negative and lateral g and severe pitch and roll oscillations. Avoid abrupt manual rudder inputs at negative load factors. If this situation is encountered, neutralizing or releasing the controls will recover the aircraft.

The combined effect of aileron and manual rudder input at negative g can be even more dramatic. With forward stick, ailerons easily overcome any opposite direction rolling moment. If cross controls are applied, inertial coupling can produce extremely rapid and disorienting oscillatory rolls (in the direction of the aileron input) in excess of 200°/second. Cross control rolls should be avoided. If this situation is encountered, neutralizing or releasing the controls will recover the aircraft.

Asymmetry has little adverse effect on recovery from negative AOA out-of-control rolls. Oscillatigns in all axes and roll rates are accentuated; however, neutral controls will still recover the aircraft almost immediately.

LOW-ALTITUDE HIGH SPEED FLIGHT

The aircraft is susceptible to gusts during low-altitude high-speed flight due to low wing loading/high lift wing characteristics. In areas of very heavy turbulence, such as found in mountainous desert terrain, flight above about 0.8 Mach may induce abrupt vertical motions. Minor lateral/directional motion will also occur. None of these disturbances significantly alter the aircraft flight path. Flight with external stores increases the wing loading and reduces the effects of gusts on the aircraft.

SECTION VII

ADVERSE WEATHER OPERATION

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Turbulence and Thunderstorms 7-1
Snow, Ice, Rain and Slush 7-2
Cold Weather Operation 7-3
Hot Weather/Desert Operation 7-5

This section provides for operation in adverse weather. Section II of this manual provides normal instrument flight procedures. These procedures differ from, or are in addition to, those contained in section II.

TURBULENCE AND THUNDERSTORMS

Avoid areas of icing, turbulence, hail, or thunderstorms, when possible, due to the increased danger of engine stagnation. If these areas cannot be avoided, turn on the engine anti-icing system before weather penetration. Monitor FTIT gages continuously during weather penetration. Increasing FTIT is an indication of engine icing. The INLET ICE light warns of icing conditions in the engine inlet. When possible, anticipate icing and turn on the anti-icing system to warm the engine inlet guide vanes.

PENETRATION

Thunderstorm penetration has not been flight tested. The aircraft structure is capable, subsonic, of withstanding the accelerations and gust loadings associated with the largest thunderstorms. The aircraft is stable and comparatively easy to control in severe turbulence if speed is not high. Severe damage may be caused by hail and lightning. Hail damage to the speed brake is increased significantly if the speed brake is extended.

PENETRATION AIRSPEED

Optimum thunderstorm penetration speed is 300 knots or best cruise, whichever is lower. Optimum thunderstorm penetration speed is a compromise between pilot comfort, controllability, structural stress, and engine inlet air distortion. At high speed, aircrew discomfort and structural stress are greater. At slow speed, controllability is reduced and inlet airflow distortion due to turbulence may cause compressor stall and/or engine stagnation.

APPROACHING THE STORM

Place the windshield anti-ice switch ON at the first sign of ice or before entering known icing conditions. Establish recommended penetration speed. Perform or check the following:

1. Throttle - ADJUST TO MAINTAIN DESIRED PENETRATION SPEED
2. Pitot heat switch - ON
3. Engine anti-ice switch - ON
4. Windshield anti-ice switch - ON
5. Lower seat.

If night penetration -

6. Storm flood switch - BRT
7. Instrument lights - BRT
8. Console lights - BRT
9. Anti-collision lights - OFF

IN THE STORM

Maintain a normal instrument scan with added emphasis on the attitude indicator (ADI) and power setting. Attempt to maintain attitude and accept altitude, AOA, and airspeed fluctuations. Ice or hail may damage the pitot tubes or AOA probe.

SNOW, ICE, RAIN AND SLUSH

TAXIING

Painted areas on runways, taxiways, and ramps are significantly slipperier than nonpainted areas. When painted areas are wet, braking may be negligible. Painted areas may serve as condensation surfaces and it is possible to have wet, frosty, or icy conditions on these areas when the overall weather is dry. With snow or ice, the approach end of the runway is usually slipperier than other areas due to melting and refreezing. There is sufficient braking effectiveness to overcome residual thrust at the very slow taxi speed required on slippery surfaces. Use care to avoid imprudent taxi speed since the braking required to quickly reduce taxi speed may cause skidding. Use of the groundspeed indicator to properly manage taxi speed is recommended. Avoid hard turns on snow or ice-covered taxiways. Expect the nose to overshoot the desired position and skid sideways when using the maneuvering nosewheel steering mode. If the nosewheel skids, straighten the nosewheel and again initiate the turn. The windshield anti-ice switch may be used momentarily to clear ice or moisture from the windshield. Inlet lip and engine face icing can occur when the ambient temperature is between 10°C (50°F) and −20°C (−4°F) and the dew point is within 0° to 3°C (5°F) of ambient temperature. If a half inch or more ice build-up is observed on the leading edge of the inlet variable ramp, mission abort should be considered. Ice ingestion from the lip or engine face even with engine anti-ice ON, can cause engine FOD and slight loss of power. Inlet lip and engine face ice build-up during taxi can be minimized during icing conditions by observing the following: Before engine start, insure the ground surface directly below and just forward of the inlet face is clear of snow, slush and water whenever the ambient temperature is below 10°C (50°F). After engine start, turn on engine anti-ice if either visible moisture is present or the dew point is within 3°C (5°F) of ambient temperature with the ambient temperature between 10°C (50°F) and −20°C (−4°F). While taxiing, avoid stopping where inlets are above areas covered by snow, slush or water. Prior to takeoff, minimize engine operation above IDLE power with ambient temperature between 2°C (36°F) and 10°C (50°F). In this temperature range and at IDLE power, water droplets in the airstream will remain above freezing. Above IDLE power, the temperature decrease thru the inlet duct is such that water will freeze on impact causing ice formation. After landing, single engine taxi during icing conditions is recommended to prevent exposure of both engines, to possible ice FOD. Do not turn the engine anti-ice switch OFF until engine shutdown.

TAKEOFF

Do not attempt takeoff with ice or snow on the aircraft.

INFLIGHT

There is always a possibility of engine and/or airframe icing in instrument conditions. Icing is most likely when takeoff is made into low clouds with temperature near freezing. Flight operations are normally above serious icing levels and the aircraft's high performance will usually enable you to move out of dangerous areas quickly. When icing is encountered, take immediate action to avoid further accumulation. Flight through ice and/or rain requires no special technique; however, engine and windshield anti-ice systems do require attention. Turn on the engine and windshield anti-ice when icing is anticipated. Do not wait until the INLET ICE light illuminates since this indicates that ice has already formed in the inlets. The L and/or R INLET light may illuminate in icing conditions below 1.33 Mach due to ice blockage of the duct static port. When icing conditions no longer exist, turning the engine anti-ice off increases engine performance (PW-100) or reduces FTIT and increases engine life (PW-220). Windshield anti-ice may be used to clear precipitation from the windshield during the approach.

NOTE

> Icing of the AOA Probes may cause pitch and roll CAS to disengage. The speed brake may also retract due to erroneous AOA information.

LANDING

When stopping distance is critical, fly final approach as slow as possible up to 23 units AOA. Precise control of airspeed and touchdown point is critical. Use of speed brake may assist in airspeed control and decreased landing roll. The velocity vector, airspeed, and AOA on the HUD can be used as aids. On a wet runway, anticipate hydroplaning. If the runway is slippery, raising the flaps will allow aerobraking to lower speeds, thereby reducing the braking required to slow to taxi speed. Landing roll can also be reduced by shutting down one engine after touchdown when committed to stop. At 70 knots, lower the nose and apply maximum wheel braking. With a crosswind, do not jeopardize directional control by attempting to aerodynamic brake to very low airspeeds. If conditions prevent a normal aerodynamic braking attitude, consider lowering the nose and commencing maximum anti-skid braking before slowing to 70 knots. Maximum wheel braking is obtained with the brake pedals fully depressed; therefore, use as much pedal force as possible (not just enough to get anti-skid cycling) without jeopardizing your ability to maintain directional control. Failure to hold the pedals fully depressed may extend the landing roll.

AFTER LANDING

Ensure windshield anti-ice switch is OFF. Single engine taxi is recommended on slippery surfaces. Use extra care when turning from runway to taxiway as transition from a relatively dry to a slippery surface can cause rotational skids. A rotational skid is insidious and will likely result in a ground loop if it starts. Slow nearly to a stop before attempting a turn under these conditions.

COLD WEATHER OPERATION

BEFORE ENTERING COCKPIT

The entire aircraft must be free of snow, ice, and frost. These are a major flight hazard and result in a loss of lift and increased stall speed. They must be removed before flight. Do not chip or scrape away ice as damage to aircraft may result.

1. Shock struts, pitot tube, fuel vents, and actuating cylinders are free of ice or dirt.
2. Fuel drain cocks free of ice.
3. All exterior covers removed.
4. JFS accumulators - 2900 PSI MINIMUM - 4000 PSI (MIL-H-83282 hydraulic fluid below −29°C (−20°F))

INTERIOR CHECK

In temperatures below 0°C (32°F), difficulty may be experienced when connecting the oxygen mask hose to the T-connector. Apply a small amount of heat to the T-connector to alleviate this problem. If the oxygen mask is not fastened, keep it well clear of the face to prevent freezing of the valves.

STARTING JFS

With the hydraulic system serviced with MIL-H-5606 hydraulic fluid, normal JFS starts may be made if the temperature is above −35°C (−31°F). Between −35°C (−31°F) and −40°C (−40°F), use double bottle starts. Below −40°C (−40°F), preheating is required.

With the hydraulic system serviced with MIL-H-83282 hydraulic fluid, normal JFS starts may be made if the temperature is above −29°C (−20°F). Between −29°C (−20°F) and −40°C (−40°F), use double bottle starts. Below −40°C (−40°F), preheating is required.

STARTING ENGINES

At temperatures below −18°C (0°F), allow the JFS to run for 1 minute prior to engaging an engine. If ambient temperature is below −30°C (−22°F), insure that gear pins are in until aircraft hydraulic and electrical power are available.

BEFORE TAXIING

Operate all flight controls and the speedbrake through several cycles. Turn on the windshield anti-ice, if required. Cycle the EEC/ENG CONTR at least twice to prevent sluggish nozzle movement which may cause compresser stall at afterburner initiation. At temperatures below −40°C (−40°F), avionics may require up to 30 minutes warm-up before operating normally. Turn on engine anti-ice if visible moisture present and ambient temperature is between +10°C (+50°F) and −20°C (−4°F). Do not wait until the INLET ICE light comes on. Use of engine anti-ice is not time limited and does not degrade engine thrust significantly. Expect idle rpm to be around 55%. Idle oil pressure may be below 15 psi. This is acceptable for taxi.

TAXIING

Avoid taxiing in deep or rutted snow since frozen brakes will likely result. Increase space between aircraft while taxiing at sub-freezing temperatures to insure safe stopping distance and to prevent icing of aircraft surfaces by melted snow and ice blown by the jet blast of preceding aircraft. The high idle thrust can produce high taxi speeds. Control taxi speeds to avoid high-speed stops or turns on slippery taxiways.

TAKEOFF

Below −20°C (−4°F), MIL rpm may be as low as 87% and FTIT may be as low as 810°C.

AFTER LANDING

Single engine taxi is recommended for easier control of taxi speed. Idle thrust is high, and remains essentially constant as temperature decreases. When wearing bulky arctic survival clothing and winter flying gloves, rapid egress from the cockpit by disconnecting the torso harness will be impeded due to the inability to see the connectors and degraded sense of touch.

BEFORE LEAVING AIRCRAFT

Leave canopy open, weather permitting, to permit circulation. This decreases windshield and canopy frosting. Check that protective covers are installed. Engine intake duct covers should not be installed until two hours after engine shutdown to prevent condensation from puddling and freezing, preventing subsequent engine rotation.

HOT WEATHER/DESERT OPERATION

Do not attempt takeoff or engine operation in a sand storm or dust storm, if avoidable. Park aircraft crosswind and shut down engine to prevent sand or dirt from damaging engine.

APPENDIX A

PERFORMANCE DATA

PART 1 INTRODUCTION A1-1

PART 2 ENGINE DATA A2-1

PART 3 TAKEOFF A3-1

PART 4 CLIMB A4-1

PART 5 RANGE A5-1

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PART 8 APPROACH AND LANDING A8-1

PART 9 COMBAT PERFORMANCE A9-1

PART 1

INTRODUCTION

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NOTE

All performance data are based on JP-4 fuel and are also applicable for JP-8 fuel.

DRAG INDEX SYSTEM

Most of the charts utilize the drag index system to effectively present the many combinations of weight/drag effects on performance. The Airplane Loading chart (figure A1-1) contains the drag number and weight of each externally carried store. The weight and drag number for external store suspension equipment are listed separately. The drag index for a specific configuration may be found by multiplying the number of stores carried by its drag number, and adding the drag number of the applicable suspension equipment. The total drag index may then be used to enter the planning data charts. Charts applicable for all loads and configuration are labeled ALL DRAG INDEXES. Charts labeled INDIVIDUAL DRAG INDEXES contain data for a range of drag numbers; i.e., individual curves/columns for a specific drag number. Supersonic data is not compatible to the drag index system; therefore, each chart is labeled for a specific configuration.

STALL SPEEDS CHARTS

The Stall Speeds charts (figures A1-3 and A1-4) present stall speeds for various combinations of gross weight, bank angle, power setting and altitude. The data is based on having the gear and flaps down (figure A1-3) or gear and flaps up (figure A1-4).

USE

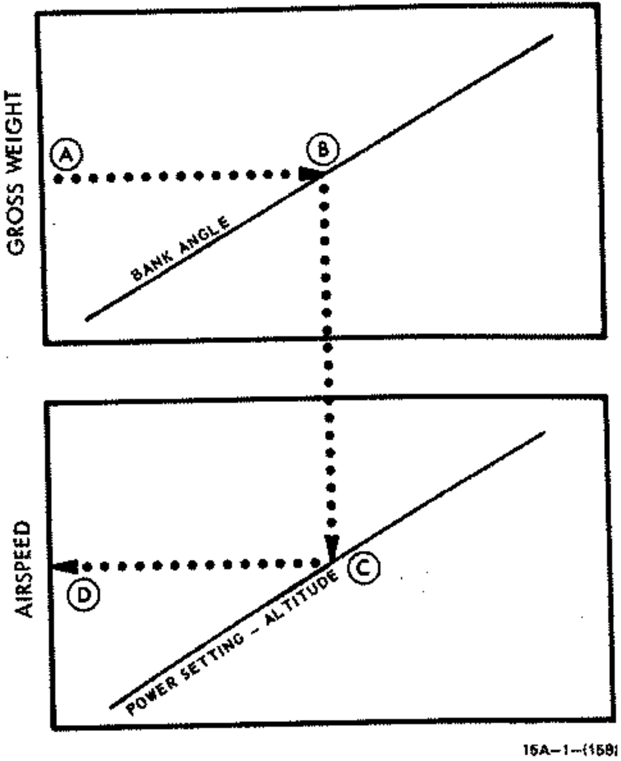
Enter the appropriate chart with the applicable gross weight and proceed horizontally to the right to intersect the applicable bank angle. From this intersection, descend vertically and intersect the applicable power setting - altitude curve. Then project horizontally left to read the stall speed.

Sample Problem

Configuration: Flaps Down, Gear Down

A. Gross weight	40,000 Lb
B. Bank angle	15°
C. Power setting - altitude - Maximum thrust	10,000 Ft
D. Stall speed	107 Kt

SAMPLE STALL SPEEDS



AIRSPEED CONVERSION

The Airspeed Conversion charts, (figures A1-5 and A1-6) provide a means of converting calibrated airspeed to true Mach number and true airspeed.

INDICATED AIRSPEED

Indicated airspeed (IAS) is the uncorrected airspeed read directly from the indicator.

CALIBRATED AIRSPEED

Calibrated airspeed (CAS) is indicated airspeed corrected for static source error.

EQUIVALENT AIRSPEED

Equivalent airspeed (EAS) is calibrated airspeed corrected for compressibility. There is no provision made for reading equivalent airspeed.

TRUE AIRSPEED

True airspeed (TAS) is equivalent airspeed corrected for density altitude. Refer to the Airspeed Conversion charts (figures A1-5 and A1-6).

AIRSPEED POSITION ERROR CORRECTION CHART

Under normal conditions, the air data computer compensates for the static source position error. If an air data computer malfunction occurs, the primary airspeed/Mach indicator becomes inoperative and airspeed is read from the standby indicator. The indicated airspeed read on this indicator may be corrected to calibrated airspeed by utilizing the Airspeed Position Error Correction chart (figure A1-7).

USE

Enter the appropriate chart with the indicated airspeed read from the standby indicator. In the flaps down, gear down configuration at 10,000 feet and below read the calibrated airspeed from the tabulated chart. In the flaps up, gear up configuration, enter the chart with the indicated airspeed and project vertically up to the appropriate altitude reflector curve. From this point, project horizontally left to read the calibrated airspeed.

Sample Problem

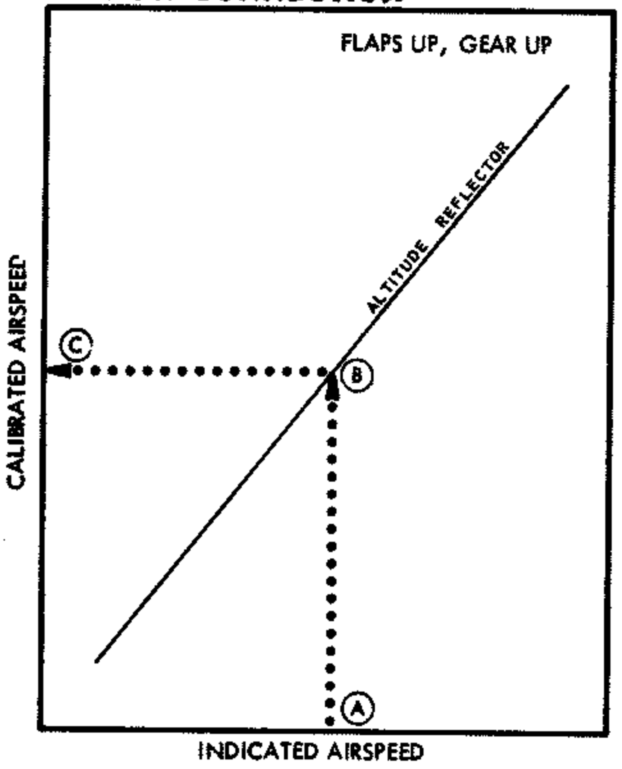
Configuration: Flaps Up, Gear Up

A. Indicated airspeed	300 Kt
B. Altitude reflector line	40,000 Ft
C. Calibrated airspeed	312 Kt

Configuration: Flaps Down, Gear Down (10,000 Ft and below)

A. Indicated airspeed	200 Kt
B. Gross weight	40,000 Lb
C. Calibrated airspeed	198.5 Kt

SAMPLE AIRSPEED POSITION ERROR CORRECTION



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ALTIMETER POSITION ERROR CORRECTION CHART

Under normal conditions, the air data computer compensates for the static source position error. If an air data computer malfunction occurs, the primary altitude indicator becomes inoperative and altitude is read from the standby indicator. The indicated altitude read on this indicator may be corrected to calibrated altitude by utilizing the Altimeter Position Error Correction chart (figure A1-8).

USE

Enter the appropriate chart with indicated airspeed. In the flaps retracted, gear up configuration project horizontally right to the assigned altitude reflector. From this point, project vertically up to the reflector line. From this point, project horizontally left to read the ΔH altitude correction. In the full flaps, gear down configuration project vertically up to the appropriate gross weight curve. From this point project horizontally left to read the ΔH altitude correction. In either case apply the ΔH altitude correction to the altimeter and fly indicated altitude.

Sample Problem

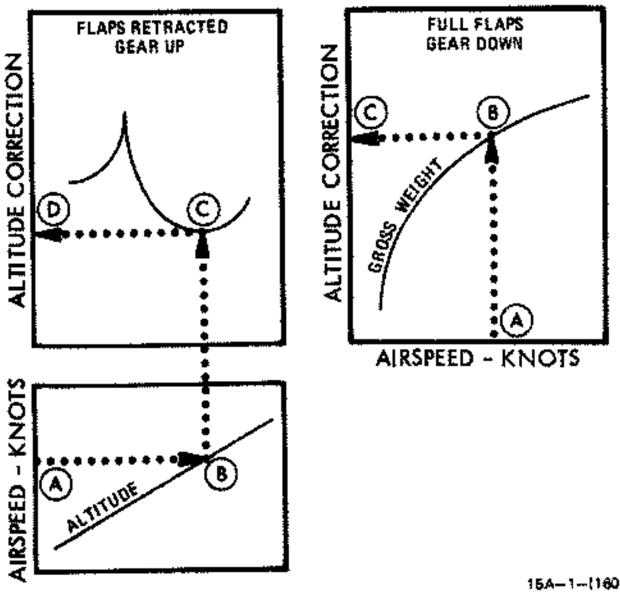
Configuration: Flaps up, Gear Up

A. Indicated airspeed	400 Kt
B. Assigned altitude	55,000 Ft
C. Reflector line	
D. ΔH correction	+375 Ft
E. Indicated altitude necessary to maintain assigned altitude (B+D)	55,375 Ft

Configuration: Flaps Down, Gear Down

A. Indicated airspeed	155 Kt
B. Gross weight	40,000 Lb
C. ΔH correction	+60 Ft

SAMPLE ALTIMETER POSITION ERROR CORRECTION



WIND COMPONENTS CHART

A standard Wind Components chart (figure A1-9) is included. It is used primarily for breaking a forecast wind down into crosswind and headwind components for takeoff computations. It may, however, be used whenever wind component information is desired. It is not to be used as a ground controllability chart.

USE

Determine the effective wind velocity by adding one-half the gust velocity (incremental wind factor) to the steady state velocity; e.g., reported wind 050/30 G40, effective wind is 050/35. Reduce the reported wind direction to a relative bearing by determining the wind direction and runway heading. Enter the chart with the relative bearing. Move along the relative bearing to intercept the effective wind speed arc. From this point, descend vertically down to read the crosswind component. From the intersection of bearing and wind speed, project horizontally left to read headwind component.

Sample Problem

Reported wind 050/35, runway heading 030.

A. Relative bearing	20°
B. Intersect windspeed arc	35 Kt
C. Crosswind component	12 Kt
D. Headwind component	33 Kt

STATION LOADING

OPERATING WEIGHT (Basic airplane plus pilot oil and unusable fuel.)
F-15A . . . . 27,500 pounds
F-15B . . . . 28,000 pounds
F-15C . . . . 28,500 pounds
F-15D . . . . 29,000 pounds

BASIC TAKEOFF WEIGHT (Operating weight plus full internal fuel.)
F-15A . . . . 39,000 pounds
F-15B . . . . 39,500 pounds
F-15C . . . . 42,000 pounds
F-15D . . . . 42,500 pounds

NOTE

FOR PRECISE AIRPLANE BASIC WEIGHT, REFER TO WEIGHT AND BALANCE DATA HANDBOOK, TO 1-1B-40, FOR THE PARTICULAR AIRPLANE.

CONFIGURATION DRAG

ITEM	WEIGHT (POUNDS)	DRAG NUMBER
F-15A/C		0
F-15B/D		2.3
Both Nozzle Flaps Removed		3.7
Two CFT with Missile Launchers	E 2349 F 11,980	4.0

ITEM	WEIGHT PER ITEM (POUNDS)	DRAG NUMBER WITHOUT CFT		DRAG NUMBER WITH CFT	
		CENTERLINE STATION	OTHER STATIONS	CENTERLINE STATION	OTHER STATIONS
AIM-9P/P-1 Missiles	172	-	2.1	-	2.1
AIM-9P-2/P-3 Missiles	182	-	2.1	-	2.1
AIM-9L, 9M, ATM-9L-4 Missiles	195	-	2.1	-	2.1
AIM-9 Adapter and LAU-114/A	79	-	1.2	-	1.2
AIM-9 Adapter and AERO-3B 30	76	-	1.2	-	1.2
AIM-7F, -7M Missiles	510	-	1.8		1.8
SUU-60/A ℄ Pylon with MAU-12C/A	296	3.3	-	3.3	-
SUU-59/A Wing Pylon with MAU-12C/A	345	-	3.3	-	3.3
610 Gallon Fuel Tank	E 320 F 4285	12.2	5.5	12.2	6.0
MXU-648/A Cargo Pod	E 98 F 398	3.6	2.6	3.6	2.9
AN/ASQ-T11, -T13 Pod	160	-	2.1	-	2.1
SUU-20B/A Dispenser	E 276 F 418	E 5.0 F 4.2	E 3.6 F 3.0	E 5.0 F 4.2	E 3.9 F 3.3
MK84 LDGP Bomb	1970	3.0	2.1	3.0	2.3
BSU-50/B Bomb	2008	5.4	3.9	5.4	4.2
GBU-10/B, -10A/B Bomb	2053	10.5	7.5	10.5	8.2
AN/ALQ-119(V)-12 ECM Pod	580	6.0	-	6.0	-
AN/ALQ-119(V)-14 ECM Pod	406	6.0	-	6.0	-
BRU-26 A/A MER	523	15.2	11.3	15.2	12.4
BDU-33 B/B,-33D/B	23	0.32	0.23	0.32	0.25
MK 20 MOD 3,4 Bomb	486	3.1	2.2	3.1	2.4
MK 82 LDGP Bomb	505	1.6	1.2	1.6	1.3
MK 82 SNAKEYE Bomb	550	2.3	1.6	2.3	1.8
BSU-49/B Bomb	550	1.8	1.3	1.8	1.4
CBU-52B/B	785	6.4	4.6	6.4	5.0
CBU-58/B, -71/B	810	6.4	4.6	6.4	5.0
AMMUNITION (940 LIVE ROUNDS) (SPENT CARTRIDGES)	531 249	-	-	-	-
ICS	316	-	-	-	-
A/A 37U-36 Aerial Gunnery Tow Target System	902	23 (captive) 45 (stowed)	-	23 (captive) 45 (stowed)	-
AN/ALQ-131 Terminal Threat Pod (Deep Config)	659	6.0 est.	-	6.0 est.	-

15A-1-(157)T

E-EMPTY F-FULL N/E NOT ESTABLISHED

Figure A1-1

STANDARD ATMOSPHERE TABLE

STANDARD SEA LEVEL AIR:
T = 59° F (15° C)
P = 29.921 IN. OF HG

W = 0.076475 LB/CU FT = 0.0023769 SLUGS/CU FT
1 IN. OF HG = 70.732 LB/SQ FT = 0.4912 LB/SQ IN.
a_0 = 1116.5 FT/SEC = 661.5 KNOTS

U.S. STANDARD ATMOSPHERE, 1966

ALTITUDE FEET	DENSITY RATIO $\rho/\rho_0 = \sigma$	$1/\sqrt{\sigma}$	AIR TEMPERATURE		SPEED OF SOUND RATIO a/a_0	PRESSURE	
			DEG. F	DEG. C		IN. OF HG	RATIO $P/P_0 = \delta$
-2.000	1.0598	0.9714	66.132	18.962	1.0068	32.15	1.0745
-1.000	1.0296	0.9855	62.566	16.981	1.0034	31.02	1.0368
0	1.0000	1.0000	59.000	15.000	1.0000	29.92	1.0000
1.000	0.9711	1.0148	55.434	13.019	0.9966	28.86	0.9644
2.000	0.9428	1.0299	51.868	11.038	0.9931	27.82	0.9298
3.000	0.9151	1.0454	48.302	9.057	0.9896	26.82	0.8962
4.000	0.8881	1.0611	44.735	7.075	0.9862	25.84	0.8637
5.000	0.8617	1.0773	41.169	5.094	0.9827	24.90	0.8320
6.000	0.8359	1.0938	37.603	3.113	0.9792	23.98	0.8014
7.000	0.8106	1.1107	34.037	1.132	0.9756	23.09	0.7716
8.000	0.7860	1.1279	30.471	- 0.849	0.9721	22.22	0.7428
9.000	0.7620	1.1456	26.905	- 2.831	0.9686	21.39	0.7148
10.000	0.7385	1.1637	23.338	- 4.812	0.9650	20.58	0.6877
11.000	0.7156	1.1822	19.772	- 6.793	0.9614	19.79	0.6614
12.000	0.6932	1.2011	16.206	- 8.774	0.9579	19.03	0.6360
13.000	0.6713	1.2205	12.640	-10.756	0.9543	18.29	0.6113
14.000	0.6500	1.2403	9.074	-12.737	0.9507	17.58	0.5875
15.000	0.6292	1.2606	5.508	-14.718	0.9470	16.87	0.5643
16.000	0.6090	1.2815	1.941	-16.699	0.9434	16.22	0.5420
17.000	0.5892	1.3028	- 1.625	-18.681	0.9397	15.57	0.5203
18.000	0.5699	1.3246	- 5.191	-20.662	0.9361	14.94	0.4994
19.000	0.5511	1.3470	- 8.757	-22.643	0.9324	14.34	0.4791
20.000	0.5328	1.3700	-12.323	-24.624	0.9287	13.75	0.4593
21.000	0.5150	1.3935	-15.889	-26.605	0.9250	13.18	0.4406
22.000	0.4976	1.4176	-19.456	-28.587	0.9213	12.64	0.4223
23.000	0.4807	1.4424	-23.022	-30.568	0.9175	12.11	0.4046
24.000	0.4642	1.4678	-26.588	-32.549	0.9138	11.60	0.3876
25.000	0.4481	1.4938	-30.154	-34.530	0.9100	11.10	0.3711
26.000	0.4325	1.5206	-33.720	-36.511	0.9062	10.63	0.3552
27.000	0.4173	1.5480	-37.286	-38.492	0.9024	10.17	0.3398
28.000	0.4025	1.5762	-40.852	-40.473	0.8986	9.725	0.3250
29.000	0.3881	1.6052	-44.419	-42.455	0.8948	9.297	0.3107
30.000	0.3741	1.6349	-47.985	-44.436	0.8909	8.885	0.2970
31.000	0.3605	1.6654	-51.551	-46.417	0.8871	8.488	0.2837
32.000	0.3473	1.6968	-55.117	-48.398	0.8832	8.106	0.2709
33.000	0.3345	1.7291	-58.683	-50.379	0.8793	7.737	0.2586
34.000	0.3220	1.7623	-62.249	-52.361	0.8754	7.382	0.2467
35.000	0.3099	1.7964	-65.816	-54.342	0.8714	7.041	0.2353
36.000	0.2981	1.8315	-69.382	-56.323	0.8675	6.712	0.2243
37.000	0.2844	1.8753	-69.700	-56.500	0.8671	6.397	0.2138
38.000	0.2710	1.9209	-69.700	-56.500	0.8671	6.097	0.2038
39.000	0.2583	1.9677	-69.700	-56.500	0.8671	5.811	0.1942
40.000	0.2462	2.0155	-69.700	-56.400	0.8671	5.538	0.1851
41.000	0.2346	2.0645	-69.700	-56.500	0.8671	5.278	0.1764
42.000	0.2236	2.1148	-69.700	-56.500	0.8671	5.030	0.1681
43.000	0.2131	2.1662	-69.700	-56.500	0.8671	4.794	0.1602
44.000	0.2031	2.2189	-69.700	-56.500	0.8671	4.569	0.1527
45.000	0.1936	2.2728	-69.700	-56.500	0.8671	4.355	0.1455
46.000	0.1845	2.3281	-69.700	-56.500	0.8671	4.151	0.1387
47.000	0.1758	2.3848	-69.700	-56.500	0.8671	3.956	0.1322
48.000	0.1676	2.4428	-69.700	-56.500	0.8671	3.770	0.1260
49.000	0.1597	2.5022	-69.700	-56.500	0.8671	3.593	0.1201
50.000	0.1522	2.5630	-69.700	-56.500	0.8671	3.425	0.1145
51.000	0.1451	2.6254	-69.700	-56.500	0.8671	3.264	0.1091
52.000	0.1383	2.6892	-69.700	-56.500	0.8671	3.111	0.1040
53.000	0.1318	2.7546	-69.700	-56.500	0.8671	2.965	0.09909
54.000	0.1256	2.8216	-69.700	-56.500	0.8671	2.826	0.09444
55.000	0.1197	2.8903	-69.700	-56.500	0.8671	2.693	0.09001
56.000	0.1141	2.9606	-69.700	-56.500	0.8671	2.567	0.08578
57.000	0.1087	3.0326	-69.700	-56.500	0.8671	2.446	0.08176
58.000	0.1036	3.1063	-69.700	-56.500	0.8671	2.331	0.07792
59.000	0.09877	3.1819	-69.700	-56.500	0.8671	2.222	0.07426
60.000	0.09414	3.2593	-69.700	-56.500	0.8671	2.118	0.07078
61.000	0.08972	3.3386	-69.700	-56.500	0.8671	2.018	0.06746
62.000	0.08551	3.4198	-69.700	-56.500	0.8671	1.924	0.06429
63.000	0.08150	3.5029	-69.700	-56.500	0.8671	1.833	0.06127
64.000	0.07767	3.5881	-69.700	-56.500	0.8671	1.747	0.05840
65.000	0.07403	3.6754	-69.700	-56.500	0.8671	1.665	0.05566

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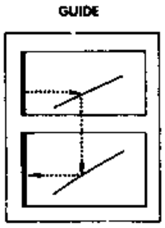
Figure A1-2

STALL SPEEDS

AIRPLANE CONFIGURATION
GEAR AND FLAPS DOWN
ALL DRAG INDEXES

REMARKS
ENGINE(S): (2) F100–PW–100
U.S. STANDARD DAY, 1966

DATE: 1 JULY 1974
DATA BASIS: **ESTIMATED**



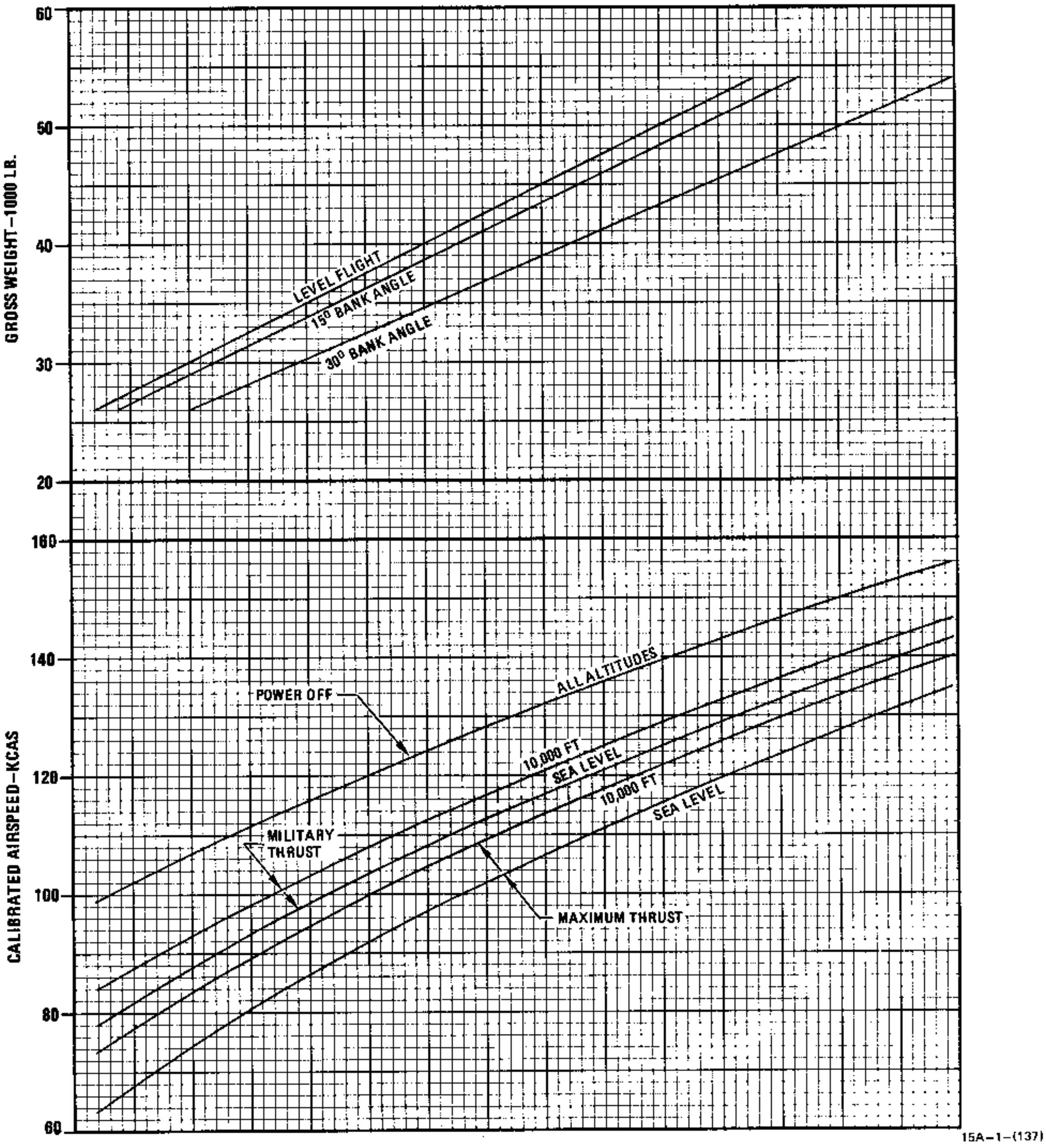
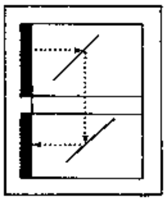


Figure A1-3

STALL SPEEDS

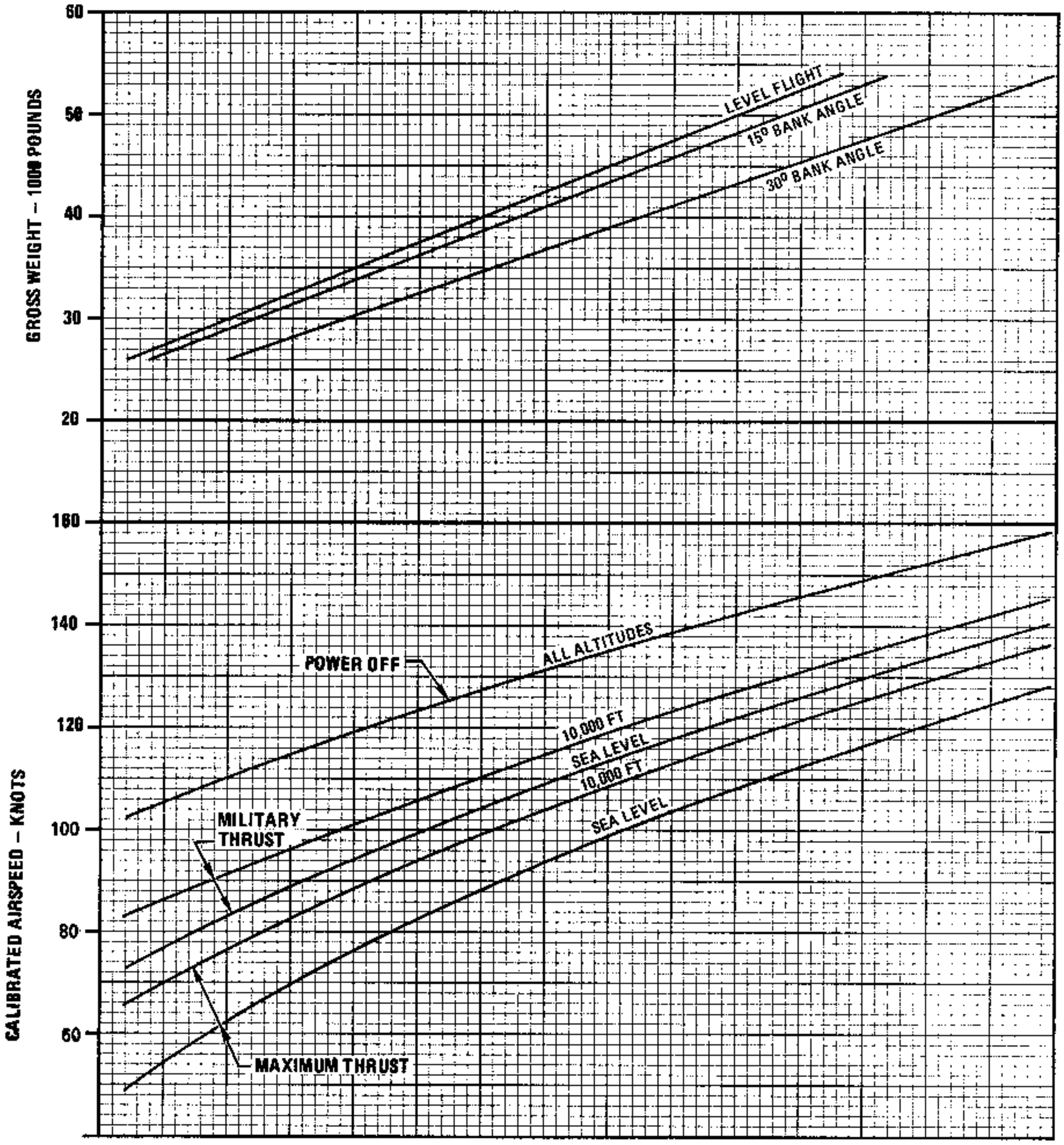
GUIDE



AIRPLANE CONFIGURATION
GEAR AND FLAPS UP
ALL DRAG INDEXES

REMARKS
ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966

DATE: 1 JULY 1974
DATA BASIS: **ESTIMATED**

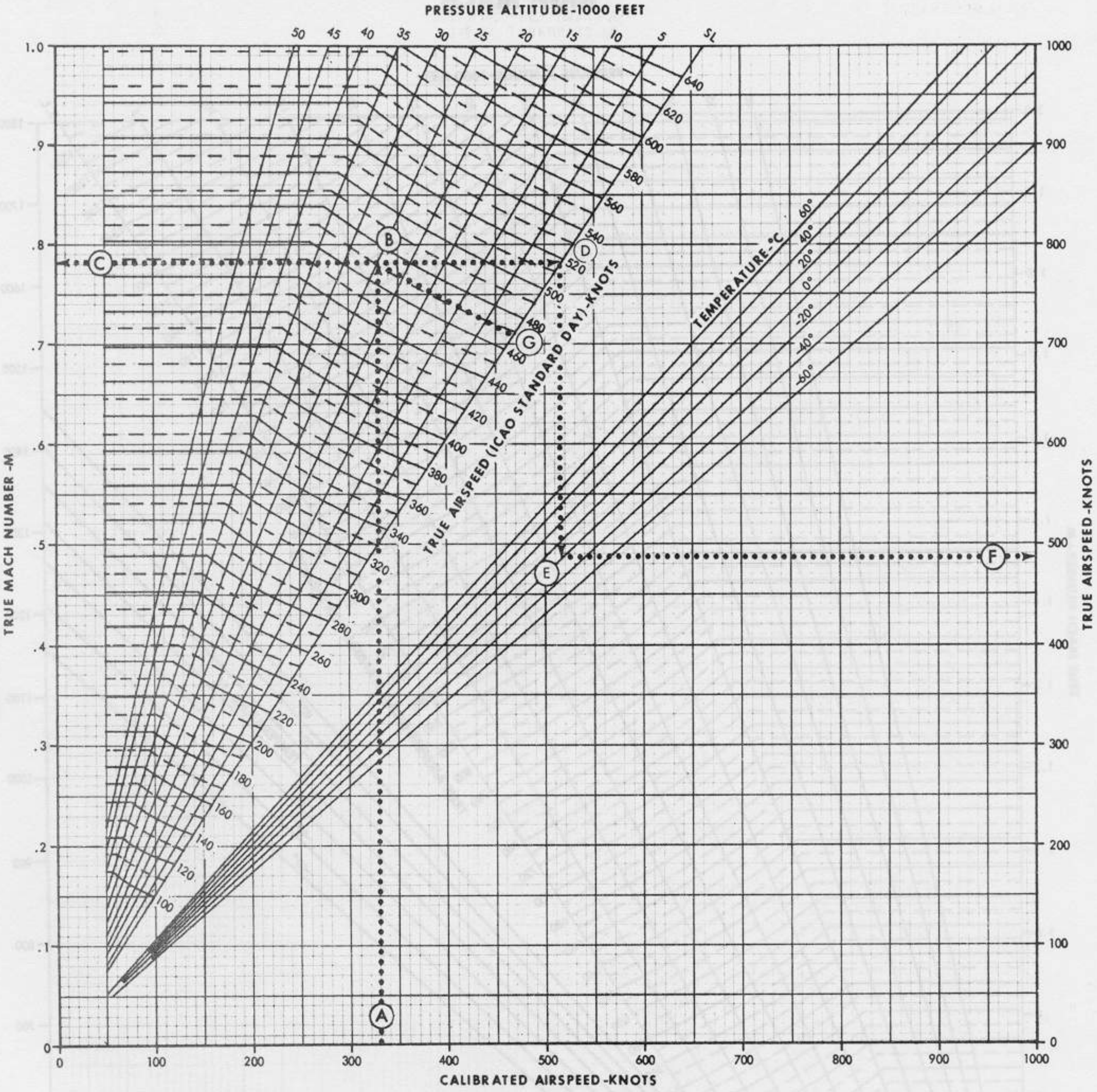


15A-1-(148)A

Figure A1-4

AIRSPEED CONVERSION

LOW MACH



EXAMPLE

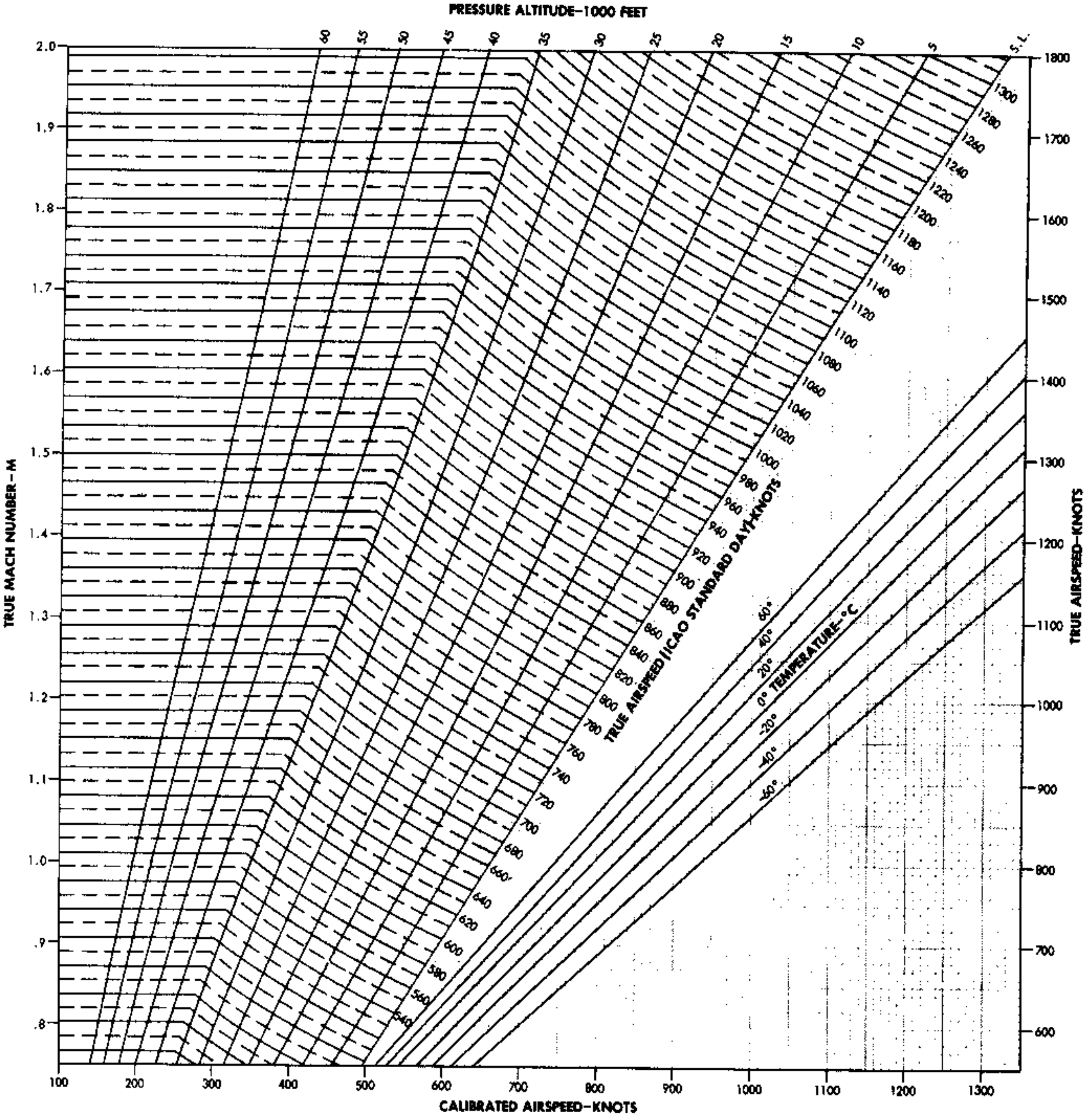
A = CAS = 330 KNOTS
B = ALTITUDE = 25,000 FEET
C = MACH = .782
D = SEA LEVEL LINE
E = TEMPERATURE = −20°C
F = TAS = 486 KNOTS
G = TAS (STANDARD DAY) = 472 KNOTS

15A–1–(183)A

Figure A1-5

AIRSPEED CONVERSION

HIGH MACH



15A–1–(182)A

Figure A1-6

AIRSPEED POSITION ERROR CORRECTION

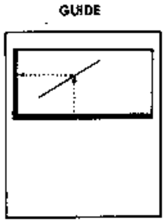
1G FLIGHT

AIRPLANE CONFIGURATION

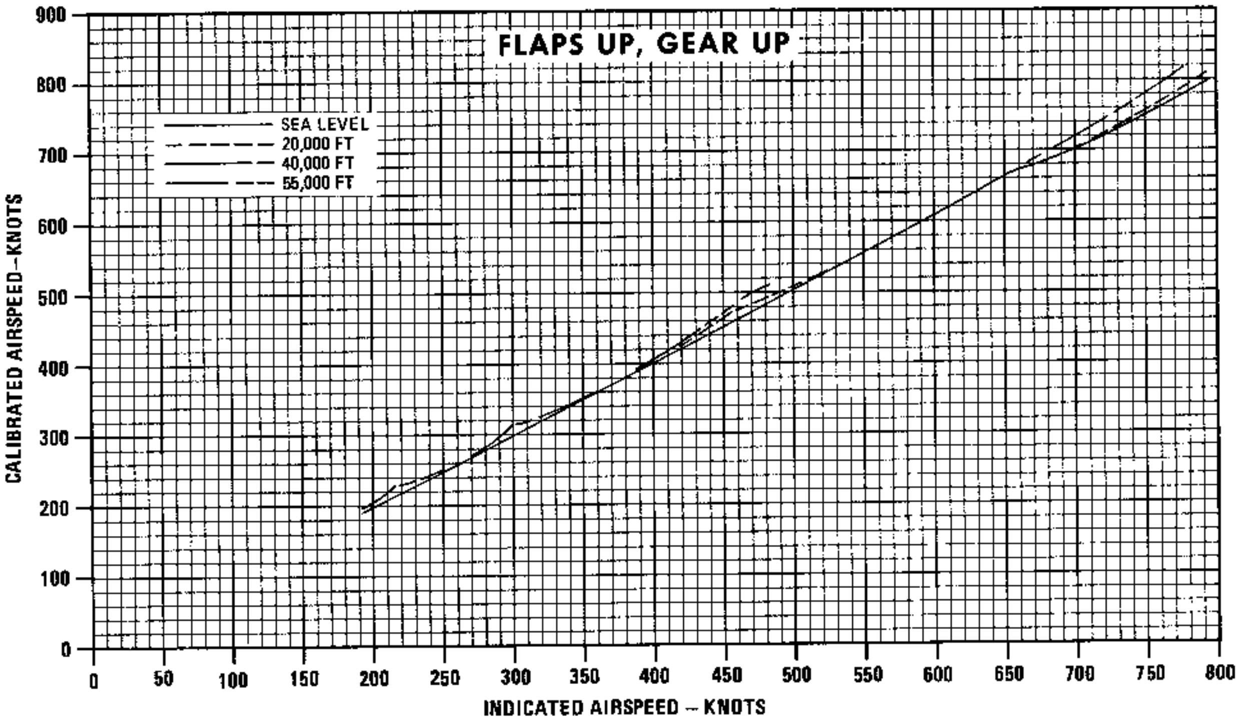
FLAPS AND GEAR AS NOTED

REMARKS

ENGINE(S): (2)F100–PW–100



DATE: 15 APRIL 1972
DATA BASIS: **ESTIMATED**



FLAPS DOWN, GEAR DOWN

10,000 FT AND BELOW

INDICATED AIRSPEED–KTS	CALIBRATED AIRSPEED-KTS GW 30,000	 GW 40,000	 GW 50,000
140	137	–	–
160	158	157	–
180	178.5	178	177
200	198.5	198.5	198
220	219	218.5	218.5
240	239	239	239

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Figure A1-7

ALTIMETER POSITION ERROR CORRECTION

STANDBY ALTIMETER ONLY

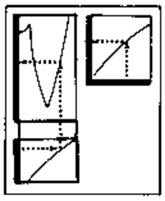
AIRPLANE CONFIGURATION
ALL DRAG INDEXES
FLAPS AND GEAR AS NOTED

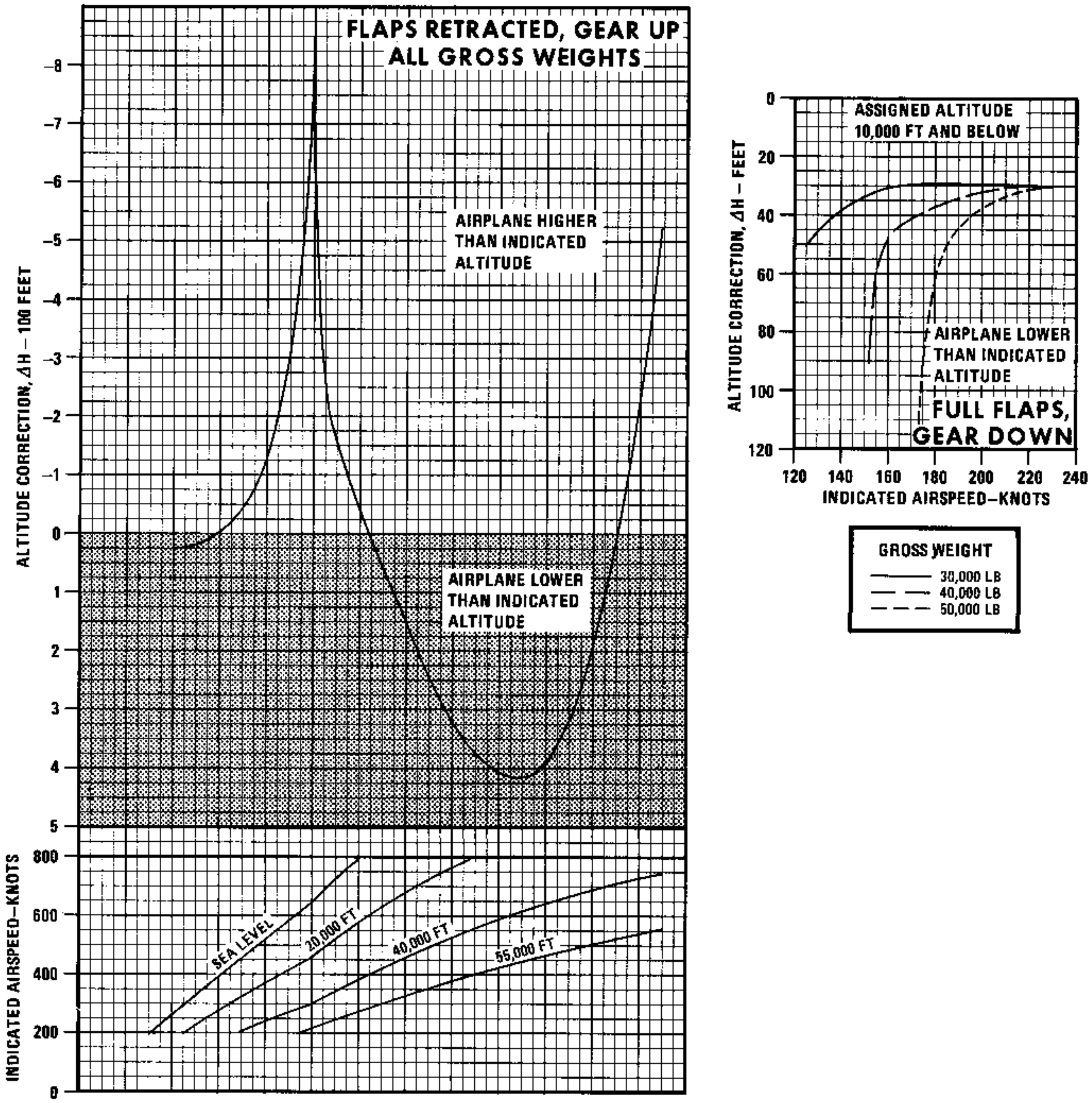
REMARKS
ENGINE(S): (2) F100–PW–100
U.S. STANDARD DAY, 1966

NOTE
ASSIGNED ALTITUDE + ΔH = INDICATED ALTITUDE. FLY INDICATED ALTITUDE.

DATE: 1 JANUARY 1973
DATA BASIS: **ESTIMATED**

GUIDE

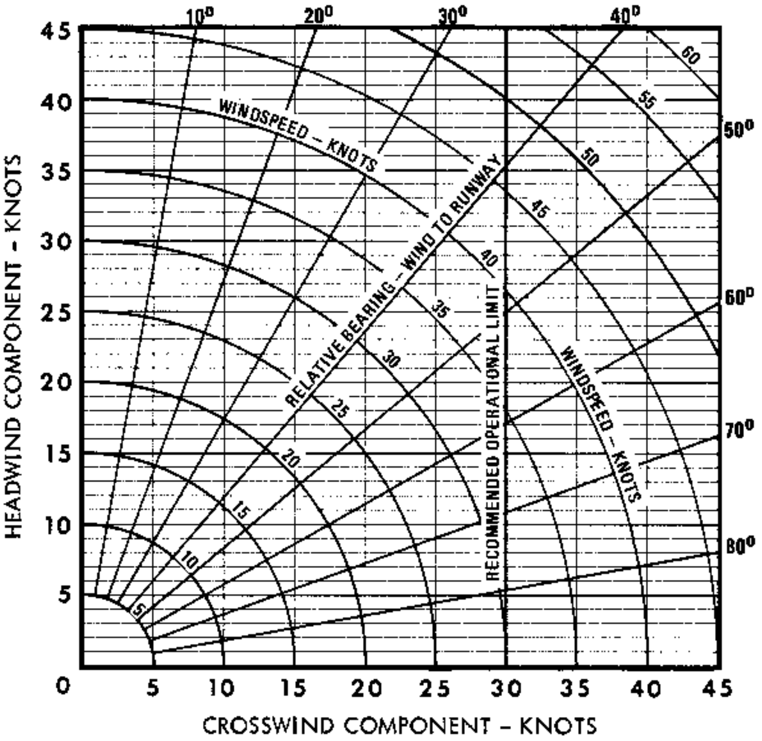




15A–1–(156)P

Figure A1-8

WIND COMPONENTS



15A-1-(176)B

Figure A1-9

PART 2

ENGINE DATA

This part not applicable.

PART 3

TAKEOFF

TABLE OF CONTENTS

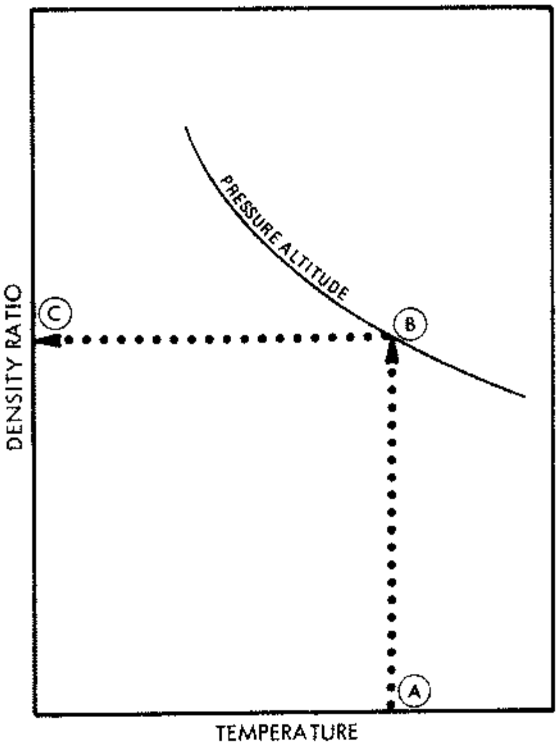
Charts

Density Ratio A3-6
Minimum Go Speed A3-7
Maximum Abort Speed A3-9
Takeoff Distance A3-11

DENSITY RATIO CHART

This chart (figure A3-1) provides a means of obtaining a single factor (density ratio) that may be used to represent a combination of temperature and pressure altitude. Density ratio must be determined before the Minimum Go Speed and Maximum Abort Speed charts can be utilized.

SAMPLE DENSITY RATIO



15A-1-(174)

USE

Enter the chart with existing temperature, and project vertically to intersect the applicable pressure altitude curve. From this point, project horizontally to the left scale to read density ratio.

Sample Problem

A. Temperature	60°F
B. Pressure Altitude	2000 Ft
C. Density ratio	0.93

MINIMUM GO SPEED CHART

This chart (figure A3-2) provides the means of determining the minimum speed at which the aircraft can experience an engine failure and still take off under existing conditions of temperature, pressure altitude, gross weight, and the runway length remaining. Separate plots are provided for maximum and military thrust conditions, and for aircraft with and without conformal fuel tanks (CFT) installed. The data is based on an engine failure occurring at the minimum go speed and allows for a 3-second decision period with one engine operating at its initial thrust setting. In the case of a military thrust takeoff, an additional 3-second period is allowed for advancing the operating engine throttle to maximum thrust.

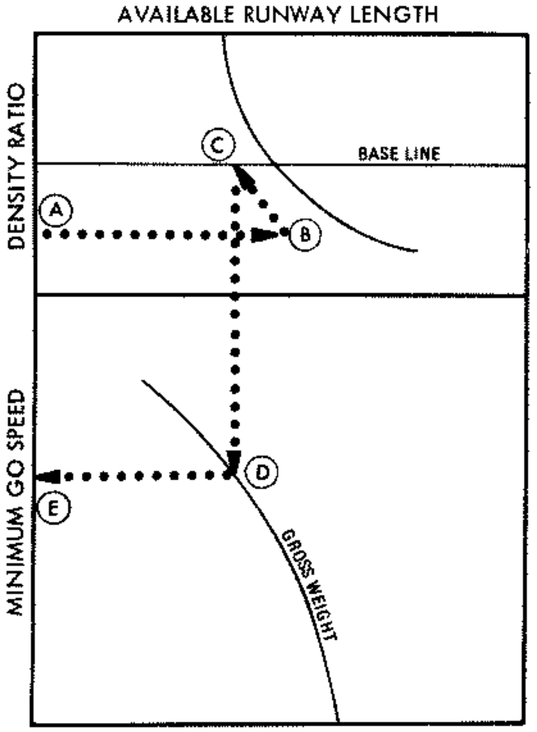
WARNING

> If an engine is lost above the maximum abort speed but below the minimum go speed, the pilot can neither abort nor take off safely on the runway length remaining without considering such factors as reducing gross weight or engaging the overrun end arrestment cable. Refer to Engine Failure During Takeoff, section III.

USE

Enter the applicable plot with the prevailing density ratio, and project horizontally to the available runway length grid line. Parallel the nearest guideline up or down to intersect the baseline. From this point descend vertically to intersect the applicable takeoff gross weight curve, then horizontally to read minimum go speed. If this projected line lies entirely to the right of the gross weight curve single engine failure can be tolerated at any speed between zero and the highest speed shown with the ground roll being within the available runway length. If the above projected line lies entirely to the left of the gross weight curve, single engine failure takeoff cannot be accomplished with the available runway length. For high gross weights and engine failure before nose rotation, the ground roll will be shortened if aft stick is relaxed until 10 to 15 knots below takeoff speed. This situation will be obvious to the pilot.

SAMPLE MINIMUM GO SPEED



15A-1-(173)

Sample Problem

Maximum Thrust Takeoff Without CFT

A. Density ratio	0.80
B. Available runway length	6000 Ft
C. Parallel guideline to baseline	
D. Takeoff gross weight	50,000 Lb
E. Minimum go speed	130 KCAS

NOTE

This problem assumes maximum thrust on operating engine within 6 seconds after engine failure. The minimum go speed for a maximum thrust takeoff will be less than that for a military thrust takeoff due to the greater acceleration with maximum thrust up to and including the 3-second decision time.

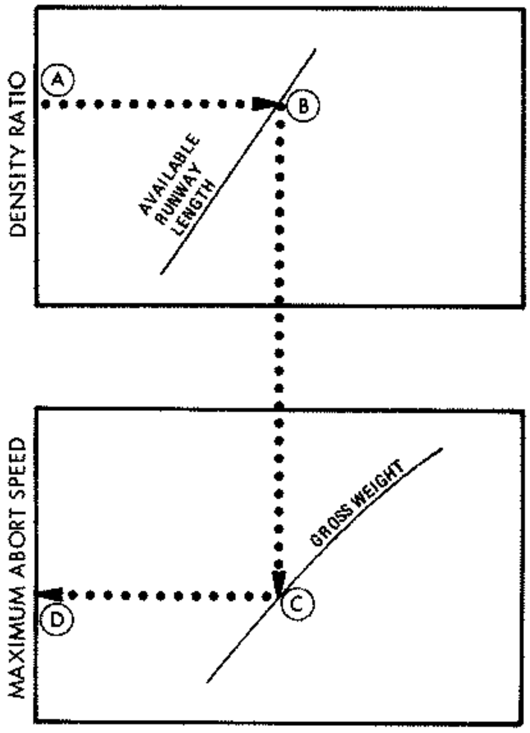
MAXIMUM ABORT SPEED CHART

NOTE

- The maximum abort speed chart does not include the capability of any arrestment gear which may be installed, and takes into account only aircraft stopping performance for the given field conditions.
- Lower weight aircraft are often shown to have lower maximum abort speeds than higher weight aircraft due to the greater acceleration of the lighter aircraft during the abort decision period used in the calculations.

This chart (figure A3-3) provides a means of determining the maximum speed at which an abort may be started and the aircraft stopped within the remaining runway length. Separate plots are provided for maximum and military thrust, and for aircraft with and without conformal fuel tanks (CFT) installed. Allowances included in this data are based on a 3-second decision period (with both engines operating at the initial thrust setting) followed by a 2-second period to apply wheel brakes and a 5-second period to reach idle thrust (these two abort procedures are initiated simultaneously).

SAMPLE MAXIMUM ABORT SPEED



15A–1–(172)

USE

Enter applicable plot with the prevailing density ratio, and project horizontally to intersect the available runway length curve. From this point, descend further to intersect the computed takeoff gross weight, then horizontally to read the corresponding maximum abort speed.

Sample Problem

Maximum Thrust Takeoff, Hard Dry Runway, Without CFT

A. Density ratio	0.80
B. Available runway length	8000 Ft
C. Gross weight	50,000 Lb
D. Maximum abort speed	131 KCAS

TAKEOFF DISTANCE CHARTS

These charts (figures A3-4 and A3-5) are used to determine the no wind ground run distance, wind adjusted ground run and the total distance required to clear a 50-foot obstacle. Separate charts are provided for maximum and military thrust, and for aircraft with and without conformal fuel tanks (CFT) installed.

USE

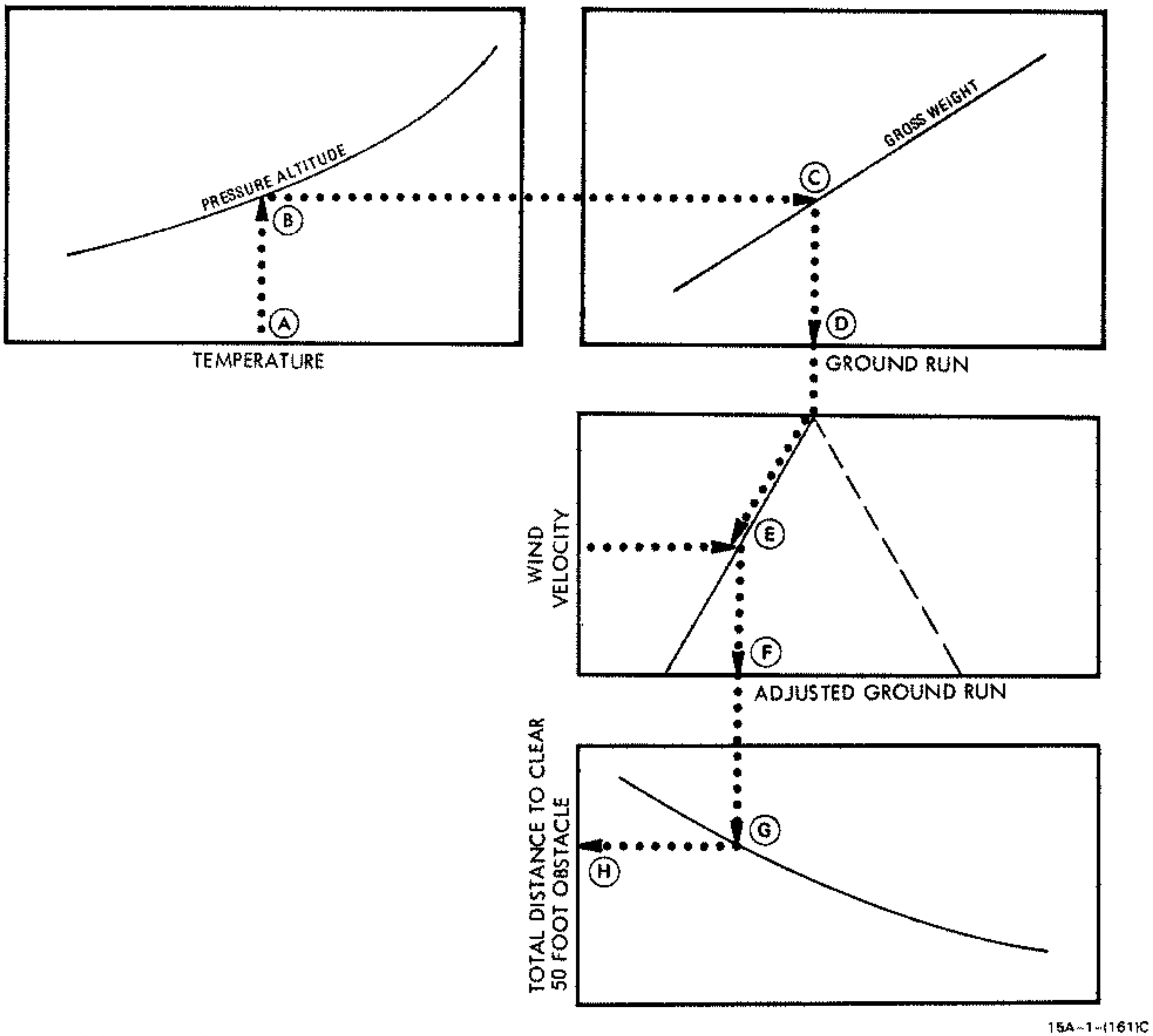
Enter the chart with existing temperature and project vertically to intersect the applicable pressure altitude curve. From that point, proceed horizontally to the right and intersect the takeoff weight line. Then descend vertically to read no wind ground run distance. Parallel the appropriate wind guideline (headwind or tailwind) to intersect the takeoff wind velocity. From this point project vertically down to read the ground run adjusted for wind effects. To find the total distance required to clear a 50-foot obstacle, continue downward to the reflector line and project horizontally to the left scale.

Sample Problem

Maximum Thrust Without CFT

A. Temperature	20°C
B. Pressure altitude	2000 Ft
C. Gross weight	50,000 Lb
D. No wind Ground run distance	2000 Ft
E. Effective headwind	25 Kt
F. Ground run (wind corrected)	1500 Ft
G. Intersect reflector line	
H. Total distance required to clear 50-foot obstacle	2600 Ft

SAMPLE TAKEOFF DISTANCE



NOSEWHEEL LIFTOFF SPEED/TAKEOFF SPEED CHART

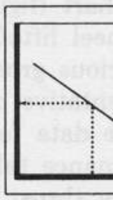
This chart (figure A3-6) is used to determine nosewheel liftoff speed and aircraft takeoff speed for various gross weights based on CG's representative of each gross weight. The charts provide data for either a normal or maximum performance takeoff in either maximum or military thrust, and also for aircraft with and without conformal fuel tanks (CFT) installed. A normal takeoff is accomplished by applying 1/2 aft stick over a period of 1 second as the aircraft is accelerating through 120 knots, and then holding 10° of pitch throughout the takeoff roll. A maximum performance takeoff is accomplished by applying full aft stick at a low speed and when the nose rotates, holding 12° of pitch throughout the takeoff roll. Aircraft rotation will be more rapid with the maximum performance takeoff technique.

The difference in nosewheel lift-off speeds between military and maximum thrust are due to the thrust effects on pitching moment. The differences in takeoff speeds are due to the thrust support in lift and the time required to rotate the aircraft to takeoff attitude. The difference in nosewheel lift-off and takeoff speeds between aircraft with and without CFT are due to the CG of CFT aircraft being higher and aft of the GG's of non-CFT aircraft for the same gross weight.

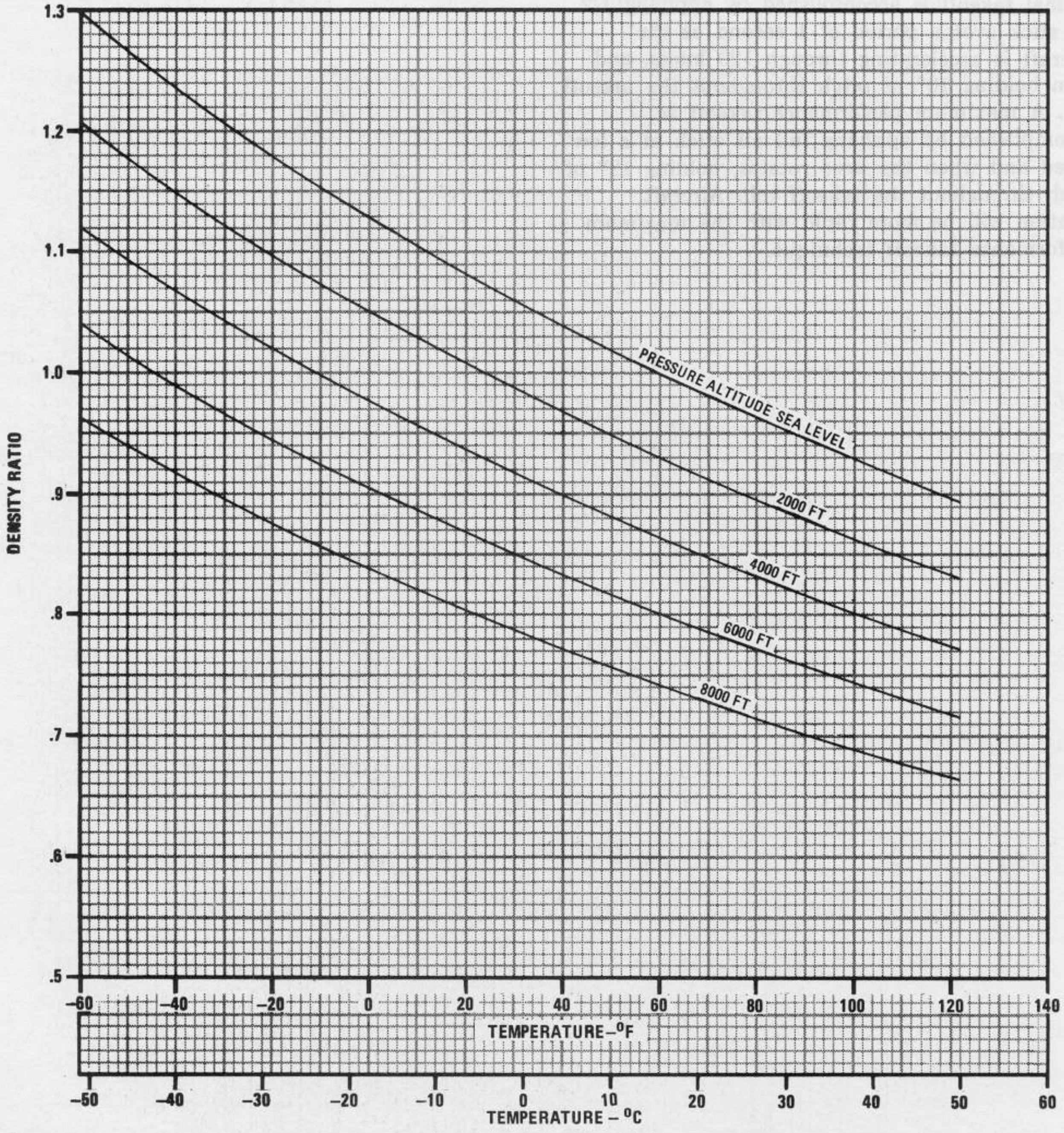
DENSITY RATIO

AIRPLANE CONFIGURATION
ALL DRAG INDEXES

GUIDE



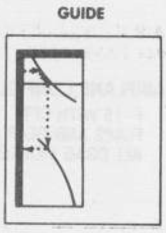
DATE: 1 JULY 1974
DATA BASIS: **FLIGHT TEST**



15A—1—(175)

Figure A3-1

MINIMUM GO SPEED
(WITH SINGLE-ENGINE FAILURE)



AIRPLANE CONFIGURATION
F-15 WITHOUT CFT
FLAPS AND GEAR DOWN
ALL DRAG INDEXES

DATE: 15 AUGUST 1983
DATA BASIS: **FLIGHT TEST**

REMARKS
ENGINES: (2) F100-PW-100
ENGINE TRIM: 97.7%

NOTES

- FOLLOWING ENGINE FAILURE WITH MILITARY THRUST, THE AFTERBURNER IS IGNITED ON THE OPERATING ENGINE.
- FULL AFT STICK APPLIED AT LOW SPEED. 12 DEGREE PITCH ATTITUDE MAINTAINED AFTER ROTATION.

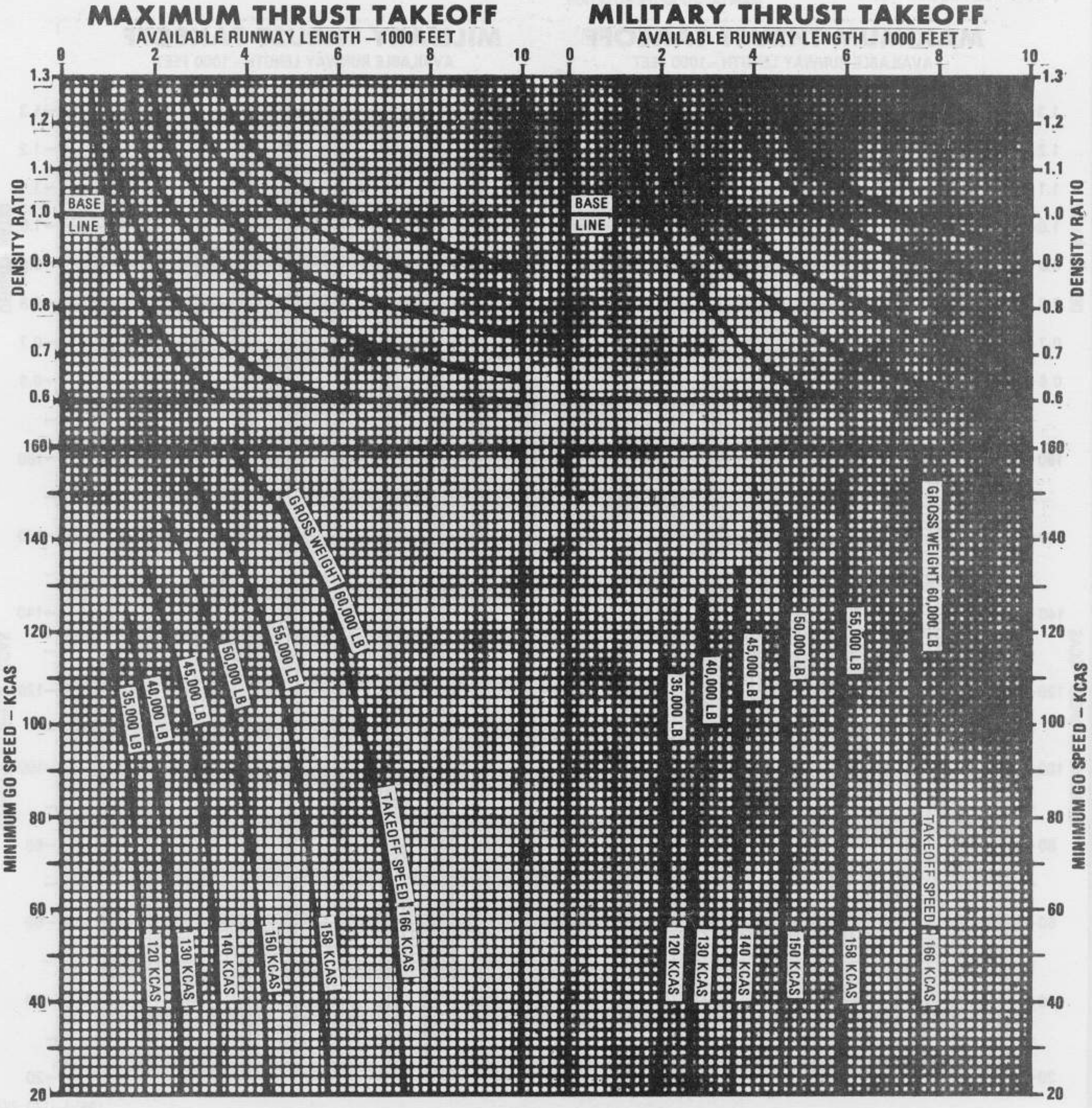
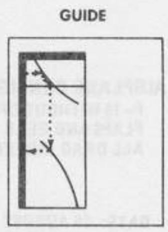


Figure A3-2 (Sheet 1 of 2)

MINIMUM GO SPEED

(WITH SINGLE-ENGINE FAILURE)



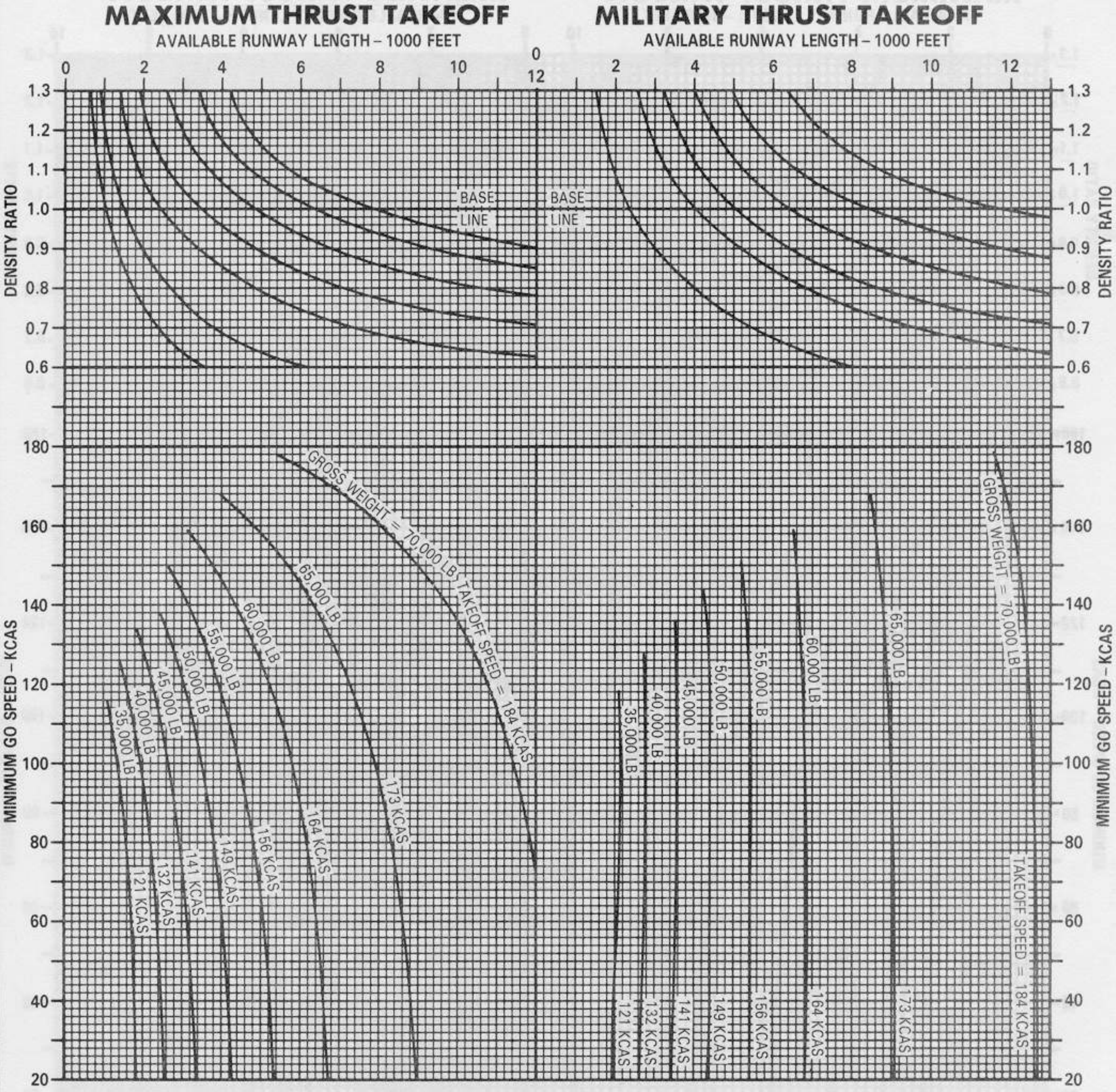
AIRPLANE CONFIGURATION
F-15 WITH CFT
FLAPS AND GEAR DOWN
ALL DRAG INDEXES

REMARKS
ENGINE(S): (2) F100-PW-100
ENGINE TRIM: 97.7%

NOTES

- FOLLOWING ENGINE FAILURE WITH MILITARY THRUST, THE AFTERBURNER IS IGNITED ON THE OPERATING ENGINE.
- FULL AFT STICK APPLIED AT LOW SPEED. 12 DEGREE PITCH ATTITUDE MAINTAINED AFTER ROTATION.

DATE: 23 AUGUST 1985
DATA BASIS: **FLIGHT TEST**

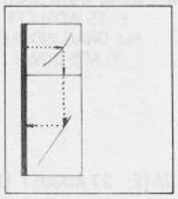


15A-1-(170-2)D

Figure A3-2 (Sheet 2)

MAXIMUM ABORT SPEED
HARD DRY RUNWAY

GUIDE



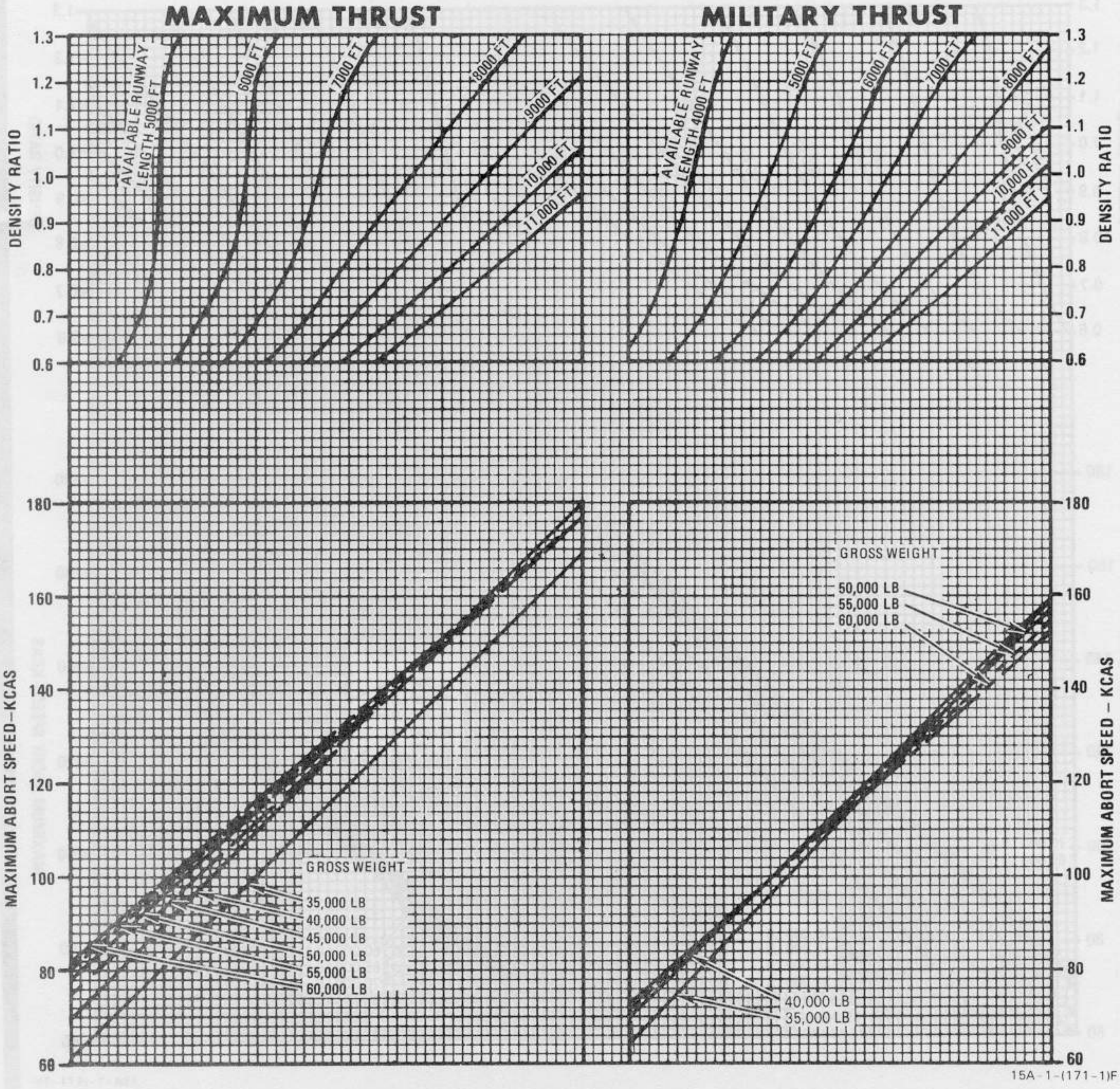
AIRPLANE CONFIGURATION
F-15 WITHOUT CFT
ALL DRAG INDEXES
FLAPS DOWN

REMARKS
ENGINE(S): (2)F100-PW-100
ENGINE TRIM: 97.7%

NOTES

- TO OBTAIN MAXIMUM ABORT SPEED FOR RCR 16 RUNWAY (WET) REDUCE RCR 26 (DRY) VALUES BY 50%.
- DATA IS FOR A NO-WIND CONDITION, ADD HEADWIND OR SUBTRACT TAILWIND TO DETERMINE ACTUAL MAXIMUM ABORT SPEED.
- FULL AFT STICK APPLIED AT LOW SPEED. 12 DEGREE PITCH ATTITUDE IS MAINTAINED AFTER ROTATION UNTIL ALTERED BY ABORT PROCEDURES.

DATE: 15 AUGUST 1983
DATA BASIS: **FLIGHT TEST**



15A-1-(171-1)F

Figure A3-3 (Sheet 1 of 2)

MAXIMUM ABORT SPEED
HARD DRY RUNWAY

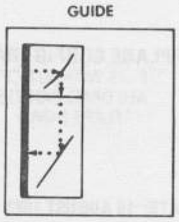
AIRPLANE CONFIGURATION
F-15 WITH CFT
ALL DRAG INDEXES
FLAPS DOWN

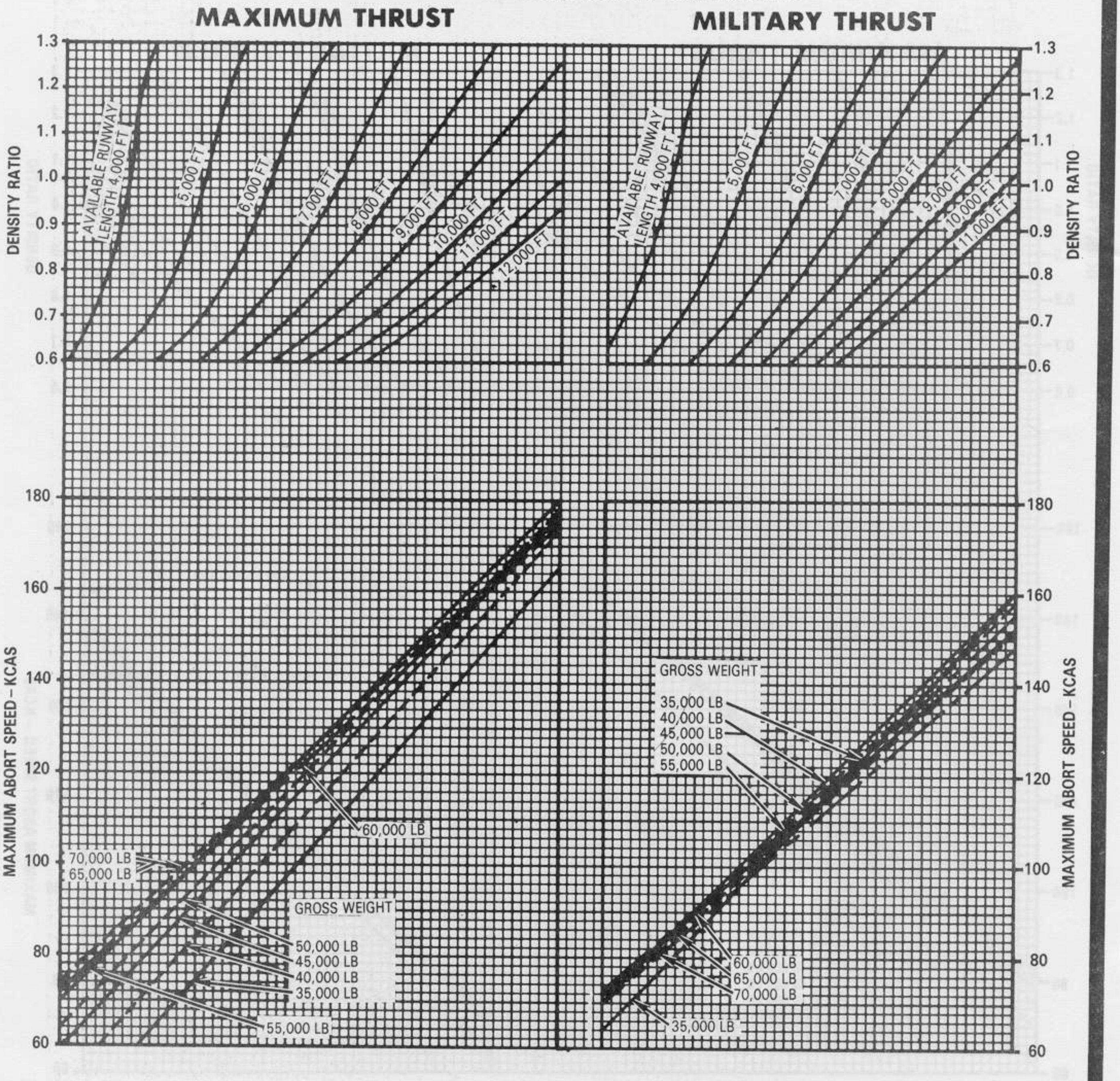
DATE: 23 AUGUST 1985
DATA BASIS: **FLIGHT TEST**

REMARKS
ENGINE(S): (2) F100-PW-100
ENGINE TRIM: 97.7%

NOTES

- TO OBTAIN MAXIMUM ABORT SPEED FOR RCR 16 RUNWAY (WET) REDUCE RCR 26 (DRY) VALUES BY 50%.
- DATA IS FOR A NO-WIND CONDITION, ADD HEADWIND OR SUBTRACT TAILWIND TO DETERMINE ACTUAL MAXIMUM ABORT SPEED.
- FULL AFT STICK APPLIED AT LOW SPEED. 12 DEGREE PITCH ATTITUDE IS MAINTAINED AFTER ROTATION UNTIL ALTERED BY ABORT PROCEDURES.





15A-1-(171-2)F

Figure A3-3 (Sheet 2)

TAKEOFF DISTANCE

MAXIMUM THRUST
HARD DRY RUNWAY

AIRPLANE CONFIGURATION

F-15 WITHOUT CFT
FLAPS AND GEAR DOWN
ALL DRAG INDEXES

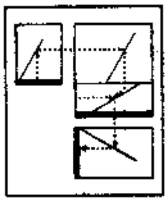
REMARKS

ENGINE(S): (2) F100-PW-100
ENGINE TRIM: 97.7%

NOTE

THESE DATA BASED ON MAXIMUM PERFORMANCE TAKEOFF PROCEDURES: FULL AFT STICK APPLIED AT LOW SPEED AND A 12 DEGREE ATTITUDE IS HELD AFTER ROTATION.

GUIDE



DATE: **15 AUGUST 1983**
DATA BASIS: **FLIGHT TEST**

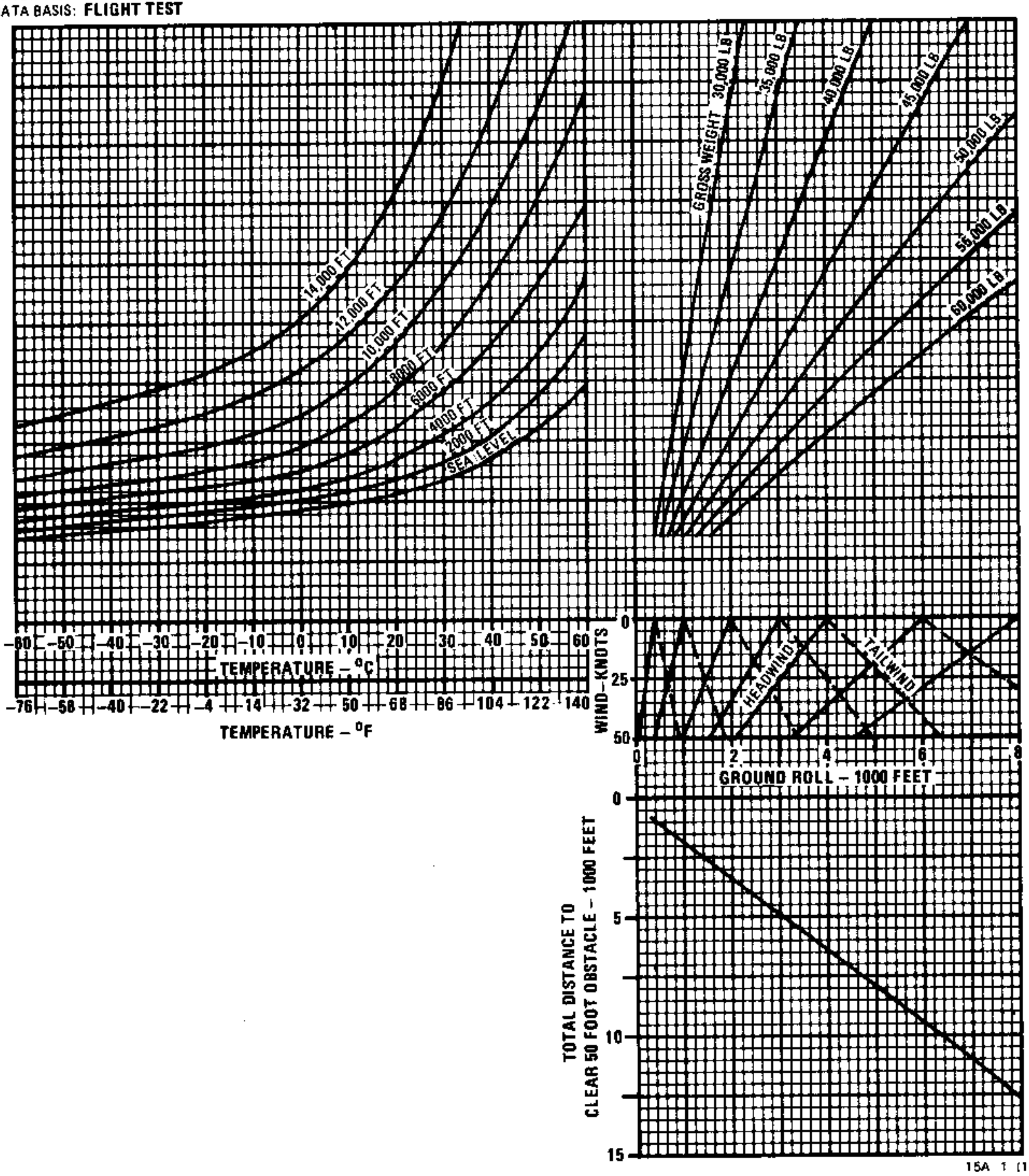


Figure A3-4 (Sheet 1 of 2)

TAKEOFF DISTANCE

MAXIMUM THRUST
HARD DRY RUNWAY

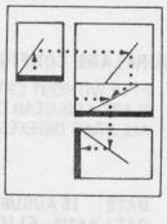
AIRPLANE CONFIGURATION
F-15 WITH CFT
FULL FLAPS, GEAR DOWN
ALL DRAG INDEXES

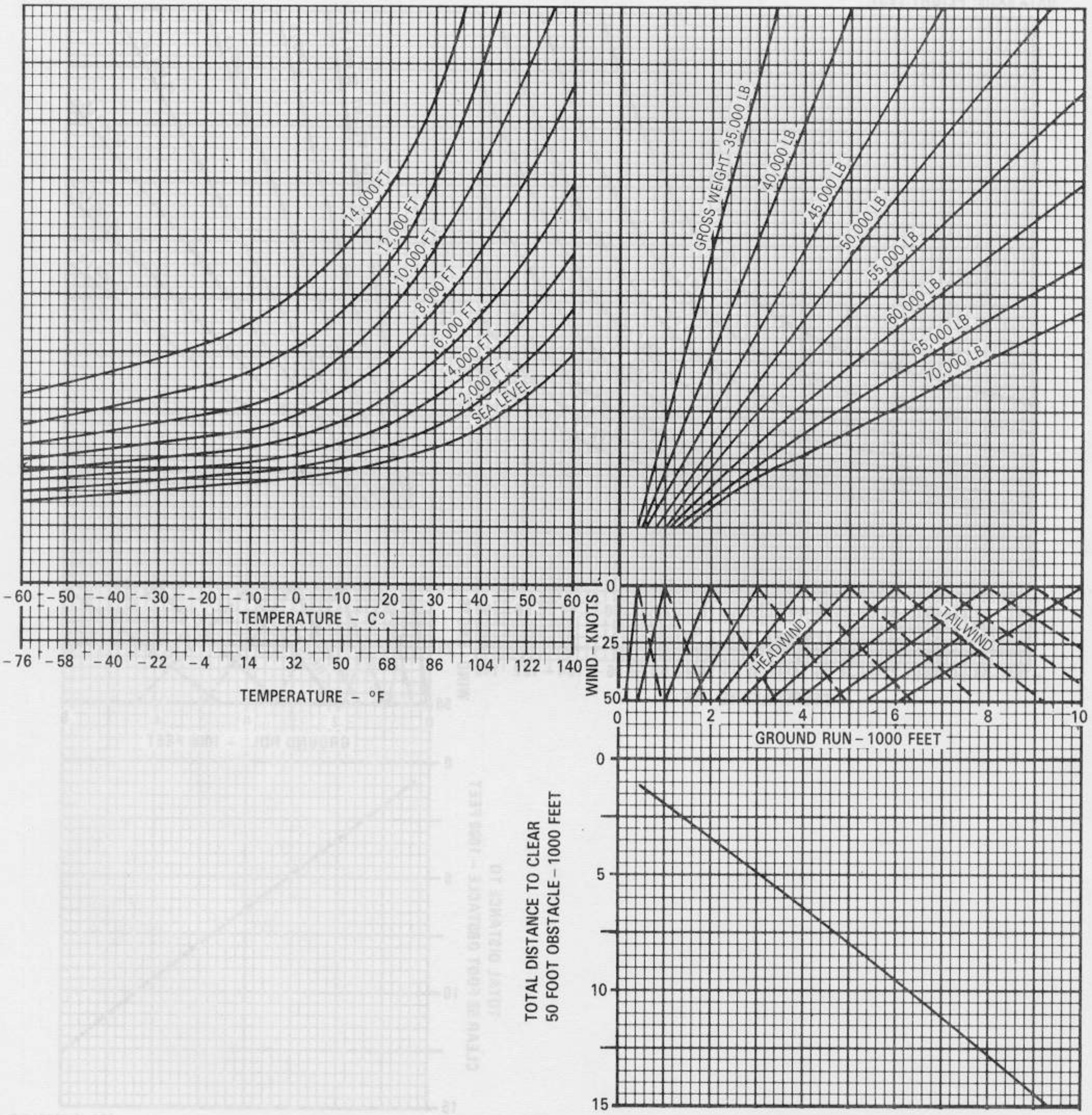
DATE: 23 AUGUST 1985
DATA BASIS: **FLIGHT TEST**

REMARKS
ENGINE(S): (2) F100-PW-100
ENGINE TRIM: 97.7%

NOTE
THESE DATA BASED ON MAXIMUM PERFORMANCE TAKEOFF PROCEDURES: FULL AFT STICK APPLIED AT LOW SPEED AND A 12 DEGREE ATTITUDE IS HELD AFTER ROTATION.

GUIDE





15A-1-(145-2)F

Figure A3-4 (Sheet 2)

TAKEOFF DISTANCE

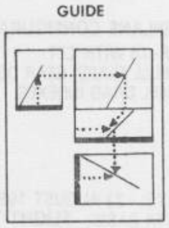
MILITARY THRUST
HARD DRY RUNWAY

AIRPLANE CONFIGURATION
F-15 WITHOUT CFT
FULL FLAPS, GEAR DOWN
ALL DRAG INDEXES

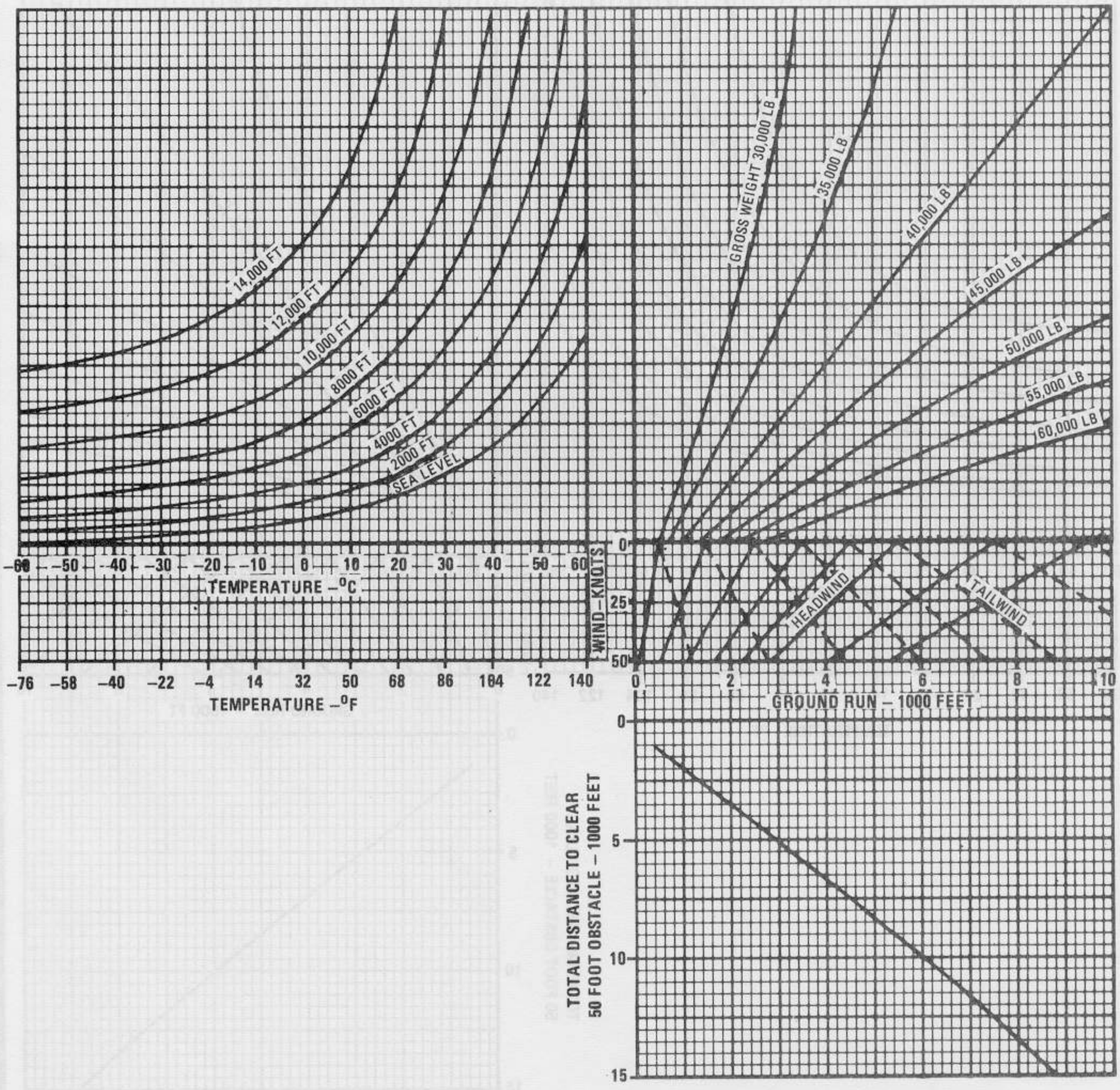
REMARKS
ENGINE(S): (2)F100-PW-100
ENGINE TRIM: 97.7%

NOTE

THESE DATA BASED ON MAXIMUM PERFORMANCE TAKEOFF PROCEDURES: FULL AFT STICK APPLIED AT LOW SPEED AND A 12 DEGREE ATTITUDE IS HELD AFTER ROTATION.



DATE: 15 AUGUST 1983
DATA BASIS: **FLIGHT TEST**



15A-1-(144-1)F

Figure A3-5 (Sheet 1 of 2)

TAKEOFF DISTANCE
MILITARY THRUST
HARD DRY RUNWAY

AIRPLANE CONFIGURATION

F-15 WITH CFT
FULL FLAPS, GEAR DOWN
ALL DRAG INDEXES

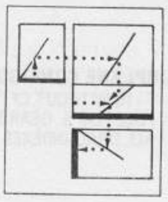
REMARKS

ENGINE(S): (2) F100-PW-100
ENGINE TRIM: 97.7%

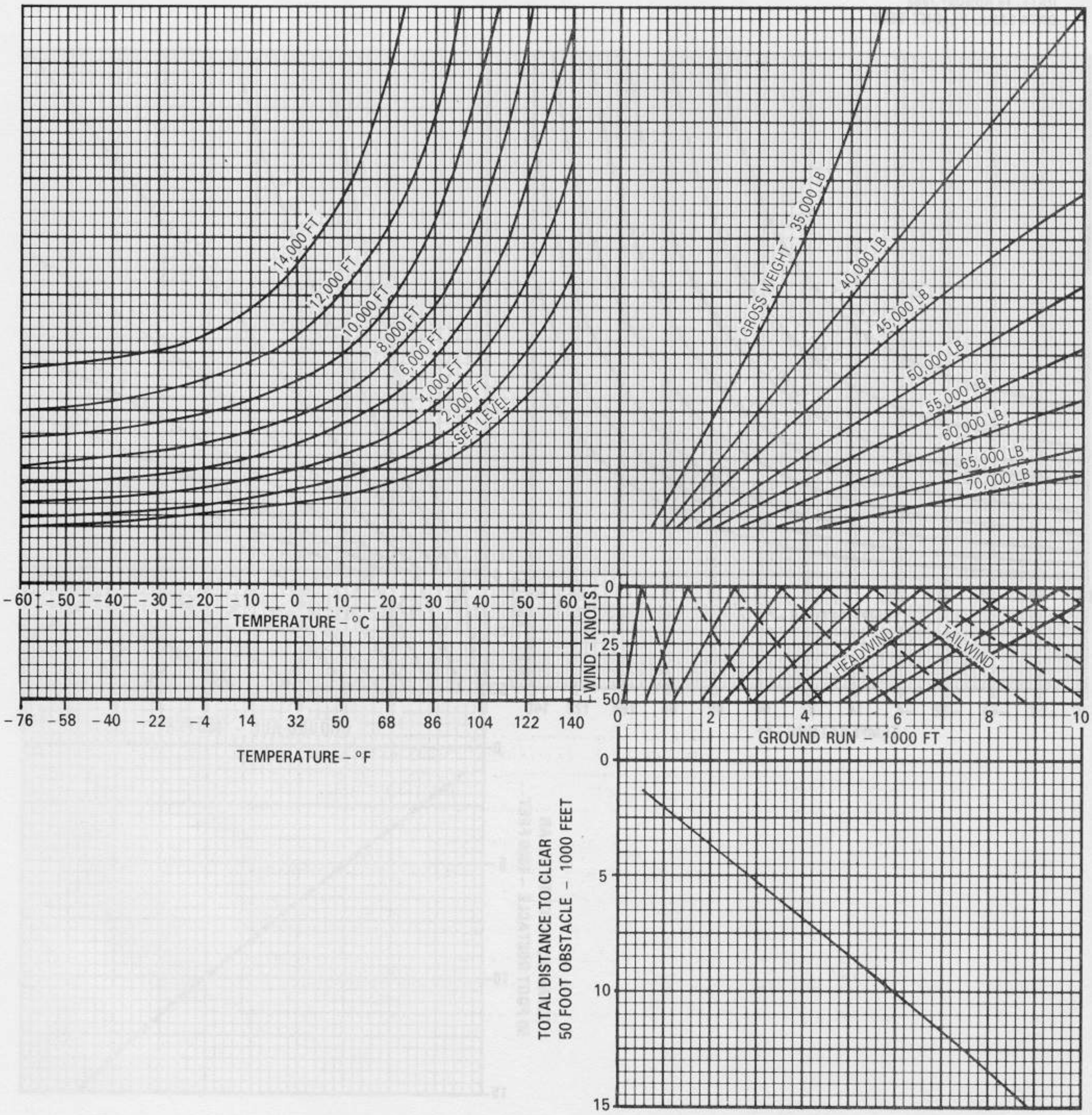
NOTE

THESE DATA BASED ON MAXIMUM PERFORMANCE TAKEOFF PROCEDURES: FULL AFT STICK APPLIED AT LOW SPEED AND A 12 DEGREE ATTITUDE IS HELD AFTER ROTATION.

GUIDE



DATE: 23 AUGUST 1985
DATA BASIS: **FLIGHT TEST**



15A-1-(144-2)F

Figure A3-5 (Sheet 2)

NOSEWHEEL LIFT-OFF SPEED/TAKEOFF SPEED

AIRPLANE CONFIGURATION
F-15 WITHOUT CFT
FULL FLAPS, GEAR DOWN
ALL DRAG INDEXES

REMARKS
ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966
ENGINE TRIM: 97.7%

NORMAL TAKEOFF

ONE–HALF AFT STICK APPLIED OVER A PERIOD OF 1 SECOND STARTING AT 120 KNOTS AND 10° ATTITUDE HELD AFTER ROTATION

GROSS WEIGHT – LB	NOSEWHEEL LIFT–OFF/TAKEOFF SPEEDS (KCAS)	
	MAXIMUM THRUST	MILITARY THRUST
30,000	129/143	124/135
35,000	134/150	128/141
40,000	136/153	129/142
45,000	137/155	130/148
50,000	139/158	131/161
55,000	150/166	141/169
60,000	158/173	148/177

MAXIMUM PERFORMANCE TAKEOFF

FULL AFT STICK APPLIED AT LOWSPEED AND 12° ATTITUDE HELD AFTER ROTATION

GROSS WEIGHT – LB	NOSEWHEEL LIFT–OFF/TAKEOFF SPEEDS (KCAS)	
	MAXIMUM THRUST	MILITARY THRUST
30,000	83/110	80/108
35,000	91/121	88/119
40,000	102/131	97/129
45,000	115/142	109/139
50,000	127/151	121/148
55,000	138/159	130/157
60,000	147/166	138/165

15A-1-(227-1)B

Figure A3-6 (Sheet 1 of 2)

NOSEWHEEL LIFT-OFF SPEED/TAKEOFF SPEED

AIRPLANE CONFIGURATION
F-15 WITH CFT
FULL FLAPS, GEAR DOWN
ALL DRAG INDEXES

REMARKS
ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966
ENGINE TRIM: 97.7%

NORMAL TAKEOFF

ONE-HALF AFT STICK APPLIED OVER A PERIOD OF 1 SECOND STARTING AT 120 KNOTS AND 10° ATTITUDE HELD AFTER ROTATION

GROSS WEIGHT - LB	NOSEWHEEL LIFT-OFF/TAKEOFF SPEEDS (KCAS)	
	MAXIMUM THRUST	MILITARY THRUST
35,000	122/139	117/136
40,000	131/148	126/140
45,000	133/152	127/148
50,000	134/154	128/156
55,000	134/160	128/164
60,000	136/168	129/172
65,000	147/182	138/186
70,000	160/190	152/194

MAXIMUM PERFORMANCE TAKEOFF

FULL AFT STICK APPLIED AT LOWSPEED AND 12° ATTITUDE HELD AFTER ROTATION

GROSS WEIGHT - LB	NOSEWHEEL LIFT-OFF/TAKEOFF SPEEDS (KCAS)	
	MAXIMUM THRUST	MILITARY THRUST
35,000	90/119	84/118
40,000	100/130	95/128
45,000	109/136	104/138
50,000	114/141	110/146
55,000	119/148	113/153
60,000	128/155	122/161
65,000	138/166	130/171
70,000	150/175	140/179

15A-1-(227-2)B

Figure A3-6 (Sheet 2)

PART 4

CLIMB

TABLE OF CONTENTS

Charts

Climb A4-3
Combat Ceiling A4-9

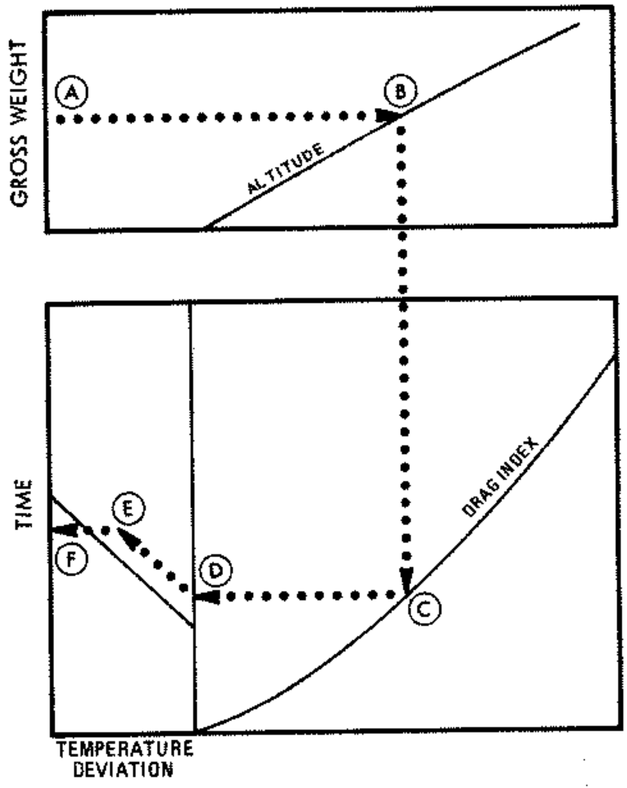
CLIMB CHARTS

The Climb charts (figures A4-1 thru A4-6) are used to determine time, fuel used, and distance covered while in the climb. Each chart is based on a military or maximum thrust climb for individual drag index configurations. The climb speed schedule and pre-climb data are noted on each chart.

USE

The method of presenting data on the time, fuel and distance charts is identical, and the use of all three charts will be undertaken simultaneously here. Enter the charts with the initial climb gross weight and project horizontally right to intersect the assigned cruise altitude or the optimum cruise altitude for the computed drag index, then vertically down to intersect the applicable drag index curve. From this point project horizontally left to the temperature baseline and parallel the nearest temperature guideline to read time, fuel or distance. Time, fuel or distance required to accelerate to climb speed must be added to the chart values.

SAMPLE CLIMB



15A-1-(162)B

Sample Problem

Military Thrust

A. Gross weight	40,000 Lb
B. Cruise altitude	30,000 Ft
C. Drag Index	20
D. Temperature baseline	
E. Temperature deviation	+10°C
F. Time	4.8 Min
G. Fuel (from Fuel Required To Climb Chart)	1245 Lb
H. Distance (from Distance Required to Climb Chart)	31 NM

COMBAT CEILING CHARTS

These charts (figures A4-7 and A4-8) present the military and maximum thrust subsonic combat ceiling for both single engine and normal two engine operation. The variable of gross weight and pressure altitude are taken into consideration for a range of drag indexes.

USE

Enter the applicable graph with estimated gross weight at end of climb. Project vertically up to intersect applicable configuration curve, then horizontally to the left to read combat ceiling.

Sample Problem

Combat Ceiling - Maximum Thrust - (2) Engines

Configuration: (4) AIM-7F missiles

A. Gross weight at end of climb	36,000 Lb
B. Drag index	7.2
C. Combat ceiling	57,200 Ft

TIME TO CLIMB

MILITARY THRUST

AIRPLANE CONFIGURATION

INDIVIDUAL DRAG INDEXES

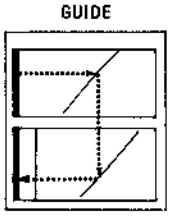
DATE: 24 JAN 1984
DATA BASIS: **FLIGHT TEST**

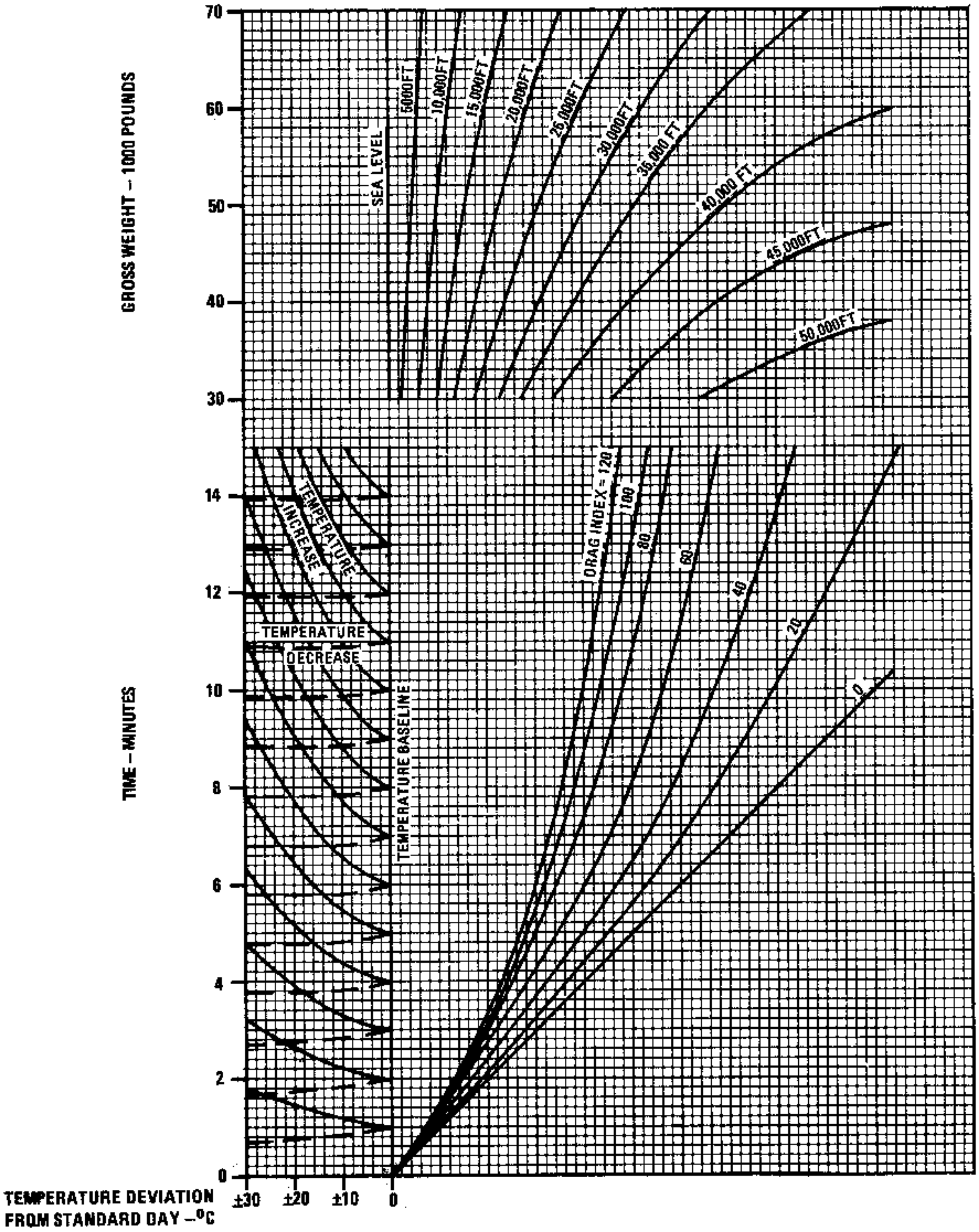
REMARKS

ENGINE (S): (2) F100–PW–100
U.S. STANDARD DAY, 1966

NOTES

- CLIMB SPEED SCHEDULE IS 350 KCAS UNTIL INTERCEPTION OF 0.90 MACH, THEN MAINTAINING 0.90 MACH TO CRUISE ALTITUDE.
- TIME FROM BRAKE RELEASE TO INITIAL CLIMB SPEED IS 1.0 MINUTES MILITARY THRUST TAKEOFF AND 0.5 MINUTES MAXIMUM THRUST TAKEOFF.





15A–1–(143)D

Figure A4-1

FUEL REQUIRED TO CLIMB

MILITARY THRUST

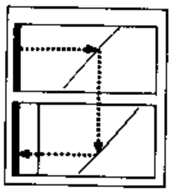
AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

DATE: 24 JANUARY 1984
DATA BASIS: **FLIGHT TEST**

REMARKS

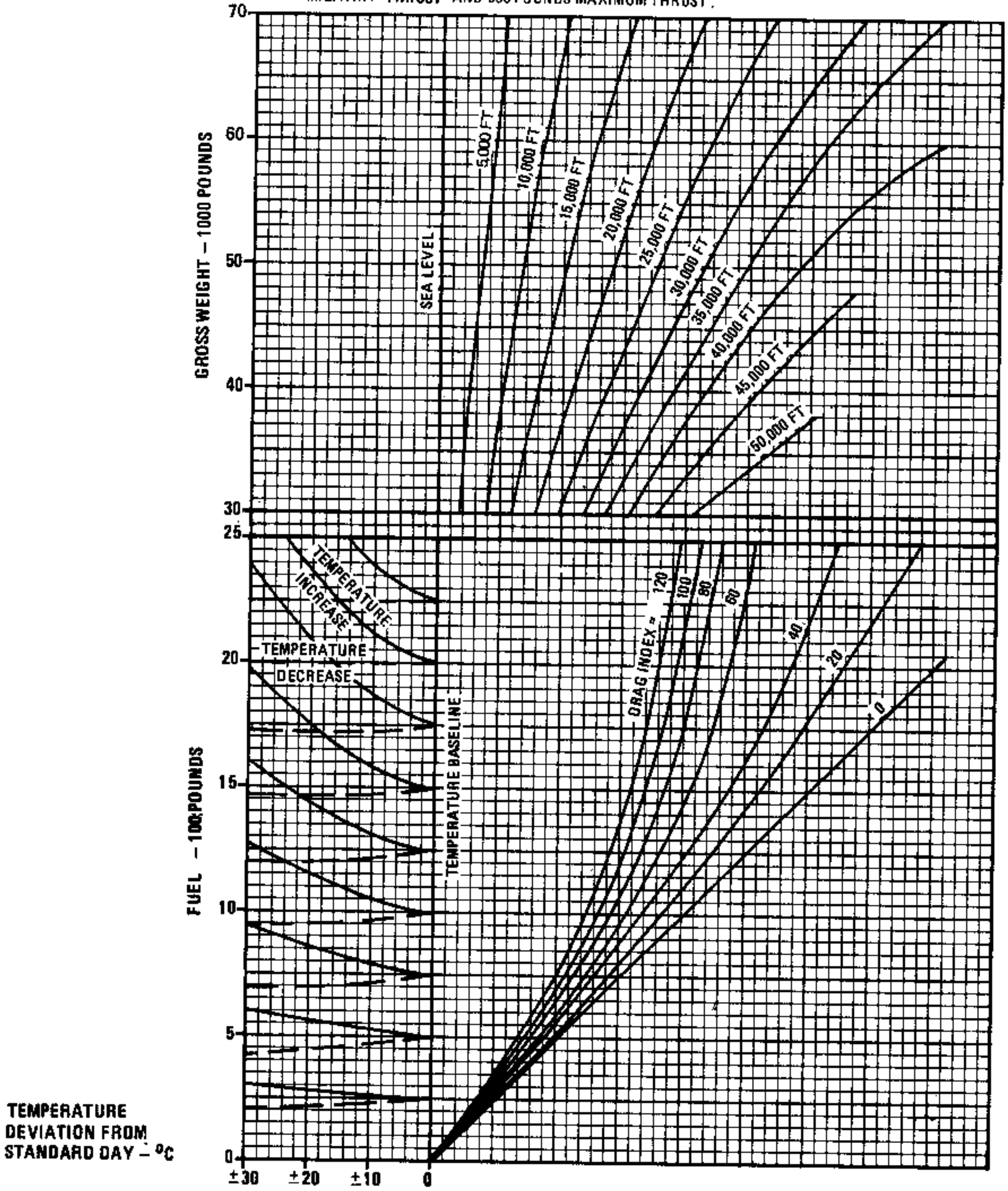
ENGINE(S) (2) F100–PW–100
U.S. STANDARD DAY, 1966

GUIDE



NOTES

- CLIMB SPEED SCHEDULE IS 350 KCAS UNTIL INTERCEPTION OF 0.90 MACH, THEN MAINTAINING 0.90 MACH TO CRUISE ALTITUDE.
- PRETAKEOFF FUEL CONSUMPTION IS AS FOLLOWS: START – 32 LB/ENG; MIL RUNUP – 82 LB/ENG; TAXI – 23 LB/MIN/ENG.
- FUEL REQUIRED FROM BRAKE RELEASE TO INITIAL CLIMB SPEED IS 300 POUNDS MILITARY THRUST AND 550 POUNDS MAXIMUM THRUST.



15A–1–(146)E

Figure A4-2

DISTANCE REQUIRED TO CLIMB

MILITARY THRUST

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

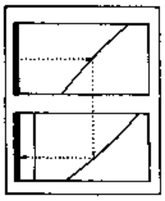
REMARKS
ENGINE(S): (2) F100–PW–100
U.S. STANDARD DAY, 1966

NOTES

CLIMB SPEED SCHEDULE IS 350 KCAS UNTIL INTERCEPTION OF 0.90 MACH, THEN MAINTAINING 0.90 MACH TO CRUISE ALTITUDE.

DISTANCE FROM BRAKE RELEASE TO INITIAL CLIMB SPEED IS 2.0 NAUTICAL MILES MILITARY THRUST TAKEOFF AND 1.0 NAUTICAL MILES MAXIMUM THRUST TAKEOFF.

DATE: 24 JAN 1984
DATA BASIS: **FLIGHT TEST**



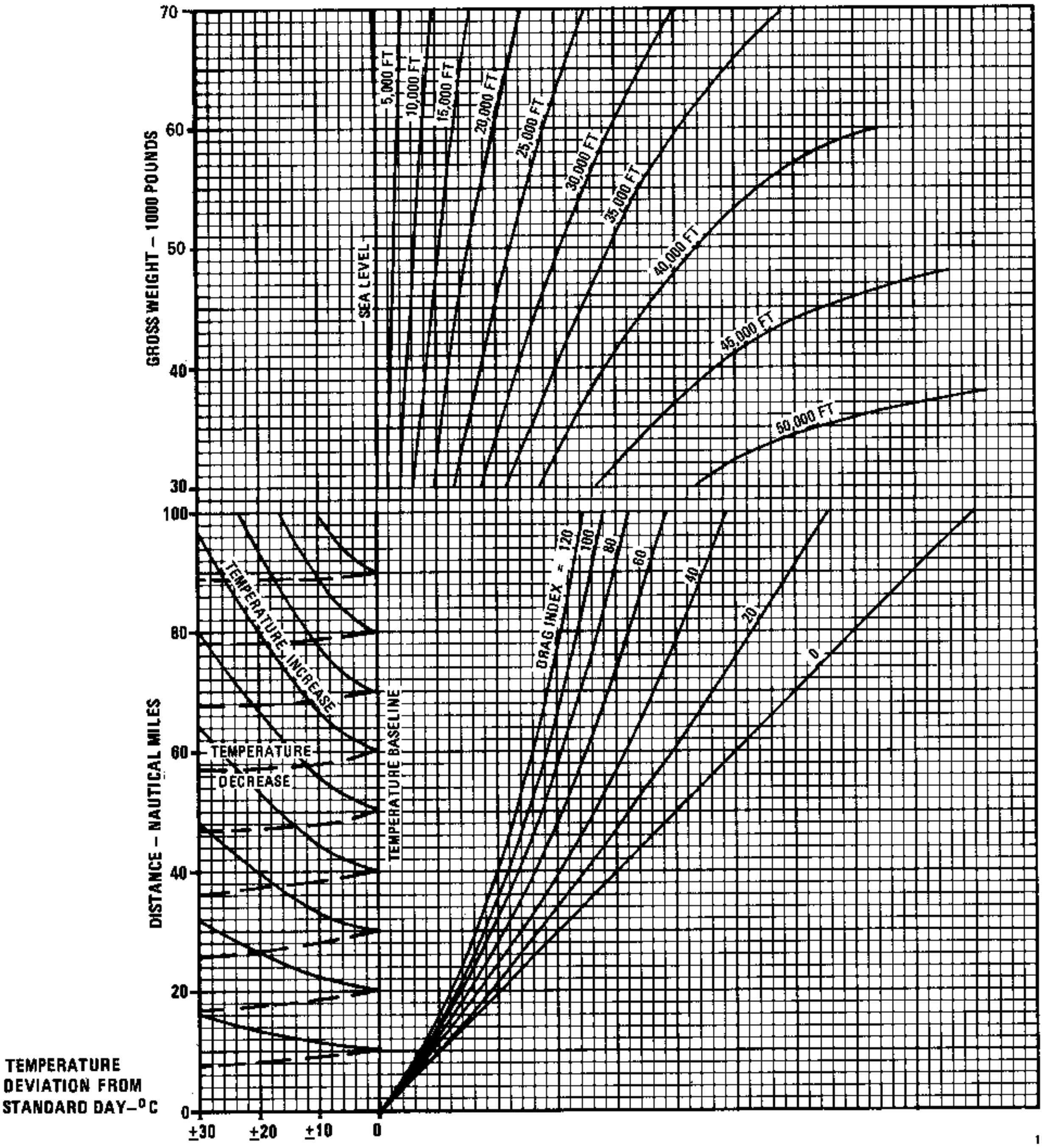


Figure A4-3

TIME TO CLIMB

MAXIMUM THRUST

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

DATE: 24 JAN 1984
DATA BASIS: FLIGHT TEST

REMARKS

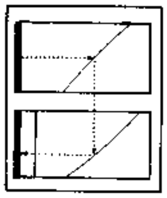
ENGINE(S): (2) F100–PW–100
U.S. STANDARD DAY, 1966

NOTE

CLIMB SPEED SCHEDULE IS 350 KCAS UNTIL INTERCEPTION OF 0.95 MACH, THEN MAINTAIN TO CRUISE ALTITUDE.

TIME FROM BRAKE RELEASE TO INITIAL CLIMB SPEED IS 0.5 MINUTES.

GUIDE



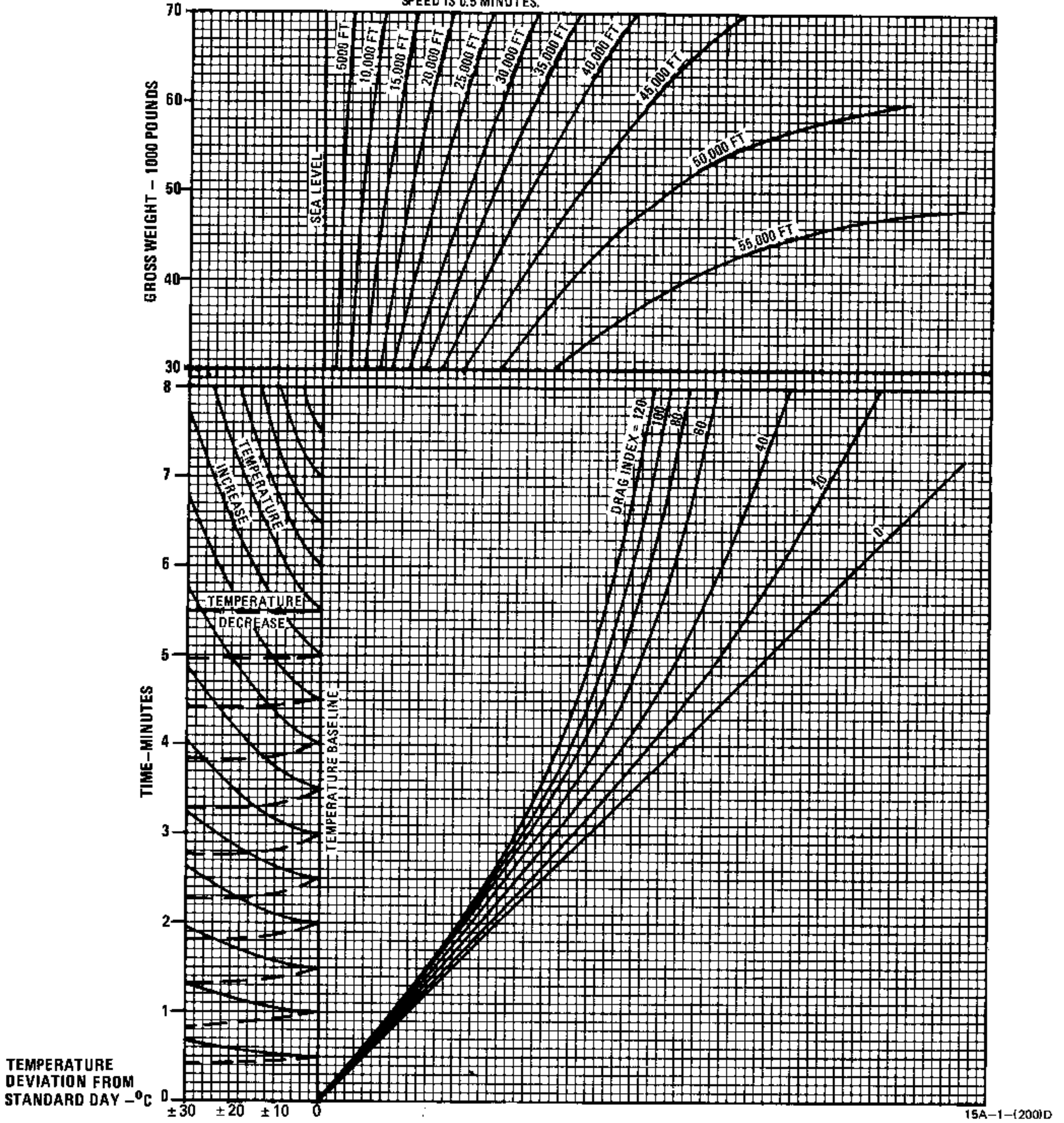


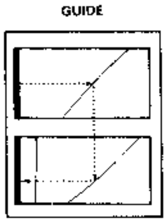
Figure A4-4

FUEL REQUIRED TO CLIMB

MAXIMUM THRUST

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINE(S): (2) F100–PW–100
U.S. STANDARD DAY, 1966



NOTES

- CLIMB SPEED SCHEDULE IS 350 KCAS UNTIL INTERCEPTION OF 0.95 MACH, THEN MAINTAIN 0.95 MACH TO CRUISE ALTITUDE.
- PRETAKEOFF FUEL CONSUMPTION IS AS FOLLOWS: START–32 LB/ENG; MIL RUNUP–82 LB/ENG; TAXI–23 LB/MIN/ENG.
- FUEL REQUIRED FROM BRAKE RELEASE TO INITIAL CLIMB SPEED IS 550 POUNDS.

DATE: 24 JAN 1984
DATA BASIS: **FLIGHT TEST**

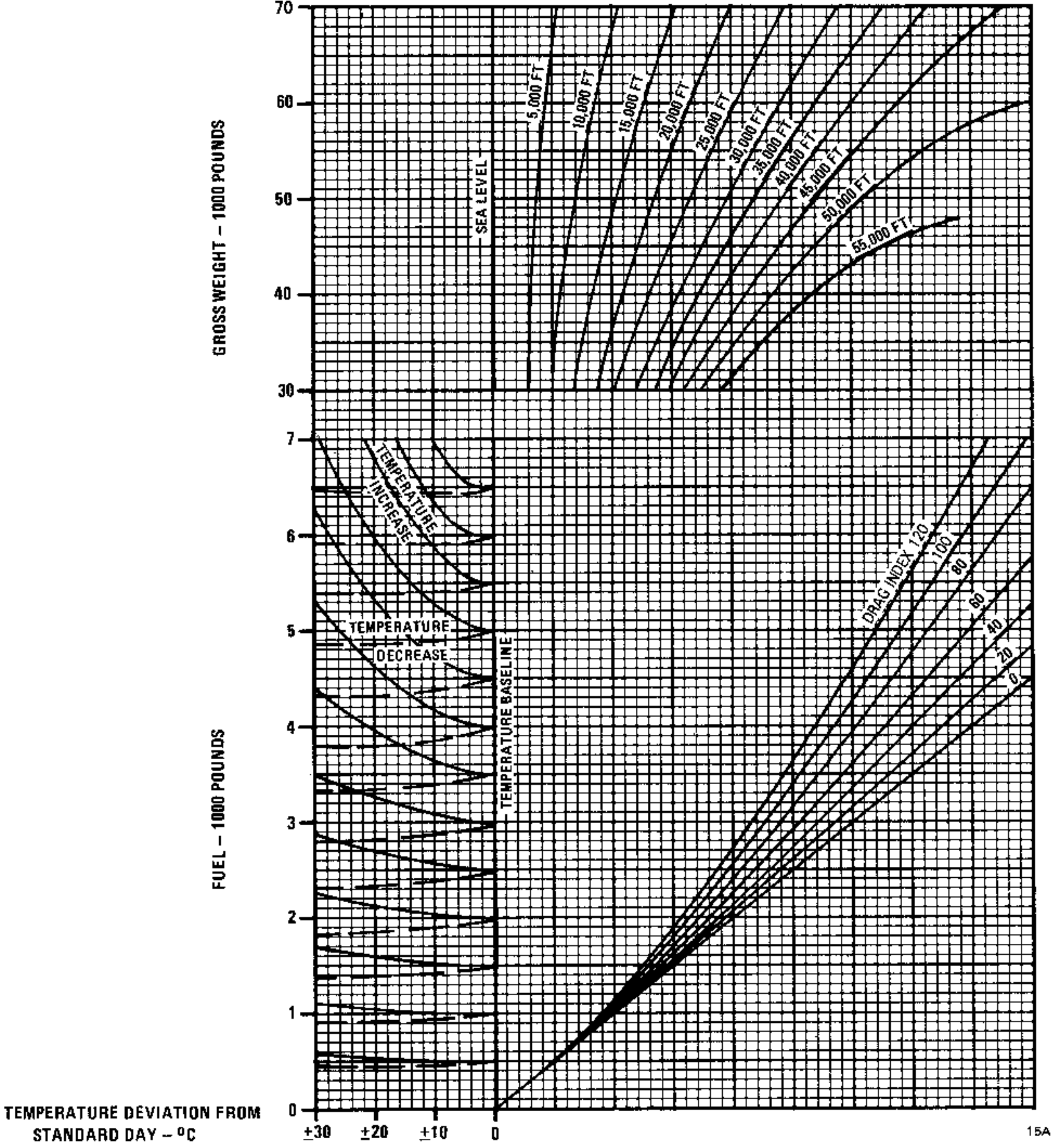


Figure A4-5

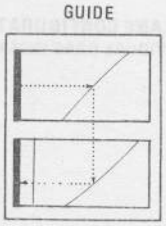
DISTANCE REQUIRED TO CLIMB
MAXIMUM THRUST

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

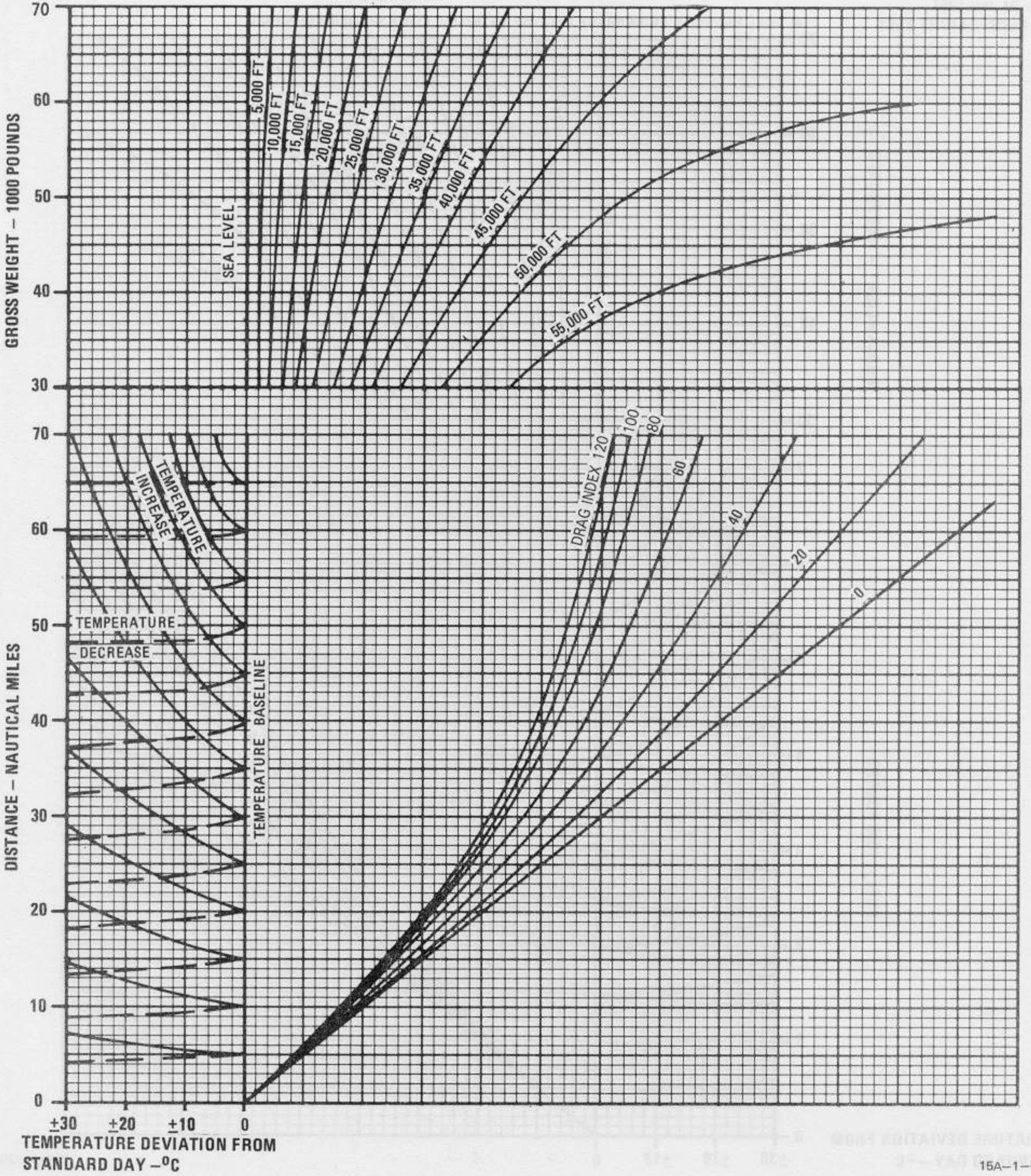
REMARKS
ENGINE(S): (2) F100–PW–100
U.S. STANDARD DAY, 1966

NOTES
CLIMB SPEED SCHEDULE IS 350 KCAS UNTIL INTERCEPTION OF 0.95 MACH, TO CRUISE ALTITUDE.

DISTANCE FROM BRAKE RELEASE TO INITIAL CLIMB IS 1.0 NAUTICAL MILES.



DATE: 24 JAN 1984
DATA BASIS: **FLIGHT TEST**



15A–1–(202)D

Figure A4-6

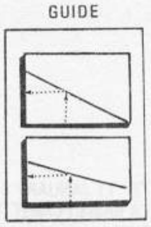
COMBAT CEILING

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

DATE: 11 JANUARY 1984
DATA BASIS: **FLIGHT TEST**

REMARKS
ENGINE(S): (2)F 100–PW–100
U. S. STANDARD DAY, 1966

NOTE
COMBAT CEILING IS THE PRESSURE ALTITUDE AT WHICH THE AIRCRAFT CAN CLIMB AT A MAXIMUM RATE OF 500 FEET PER MINUTE.



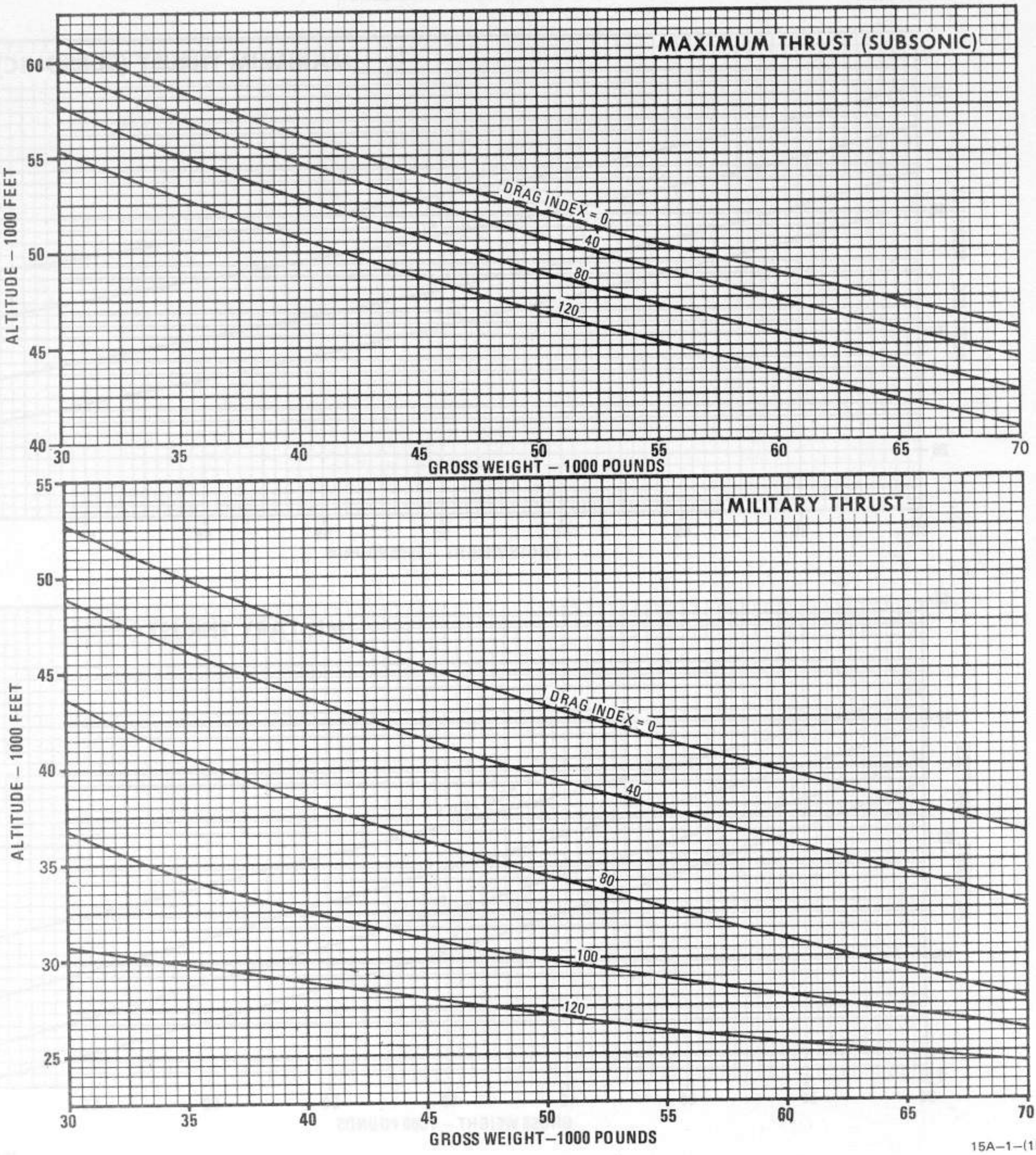


Figure A4-7.

COMBAT CEILING

ONE ENGINE OPERATING

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

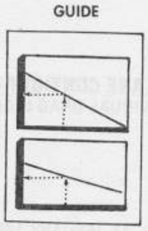
DATE: 11 JANUARY 1984
DATA BASIS: **FLIGHT TEST**

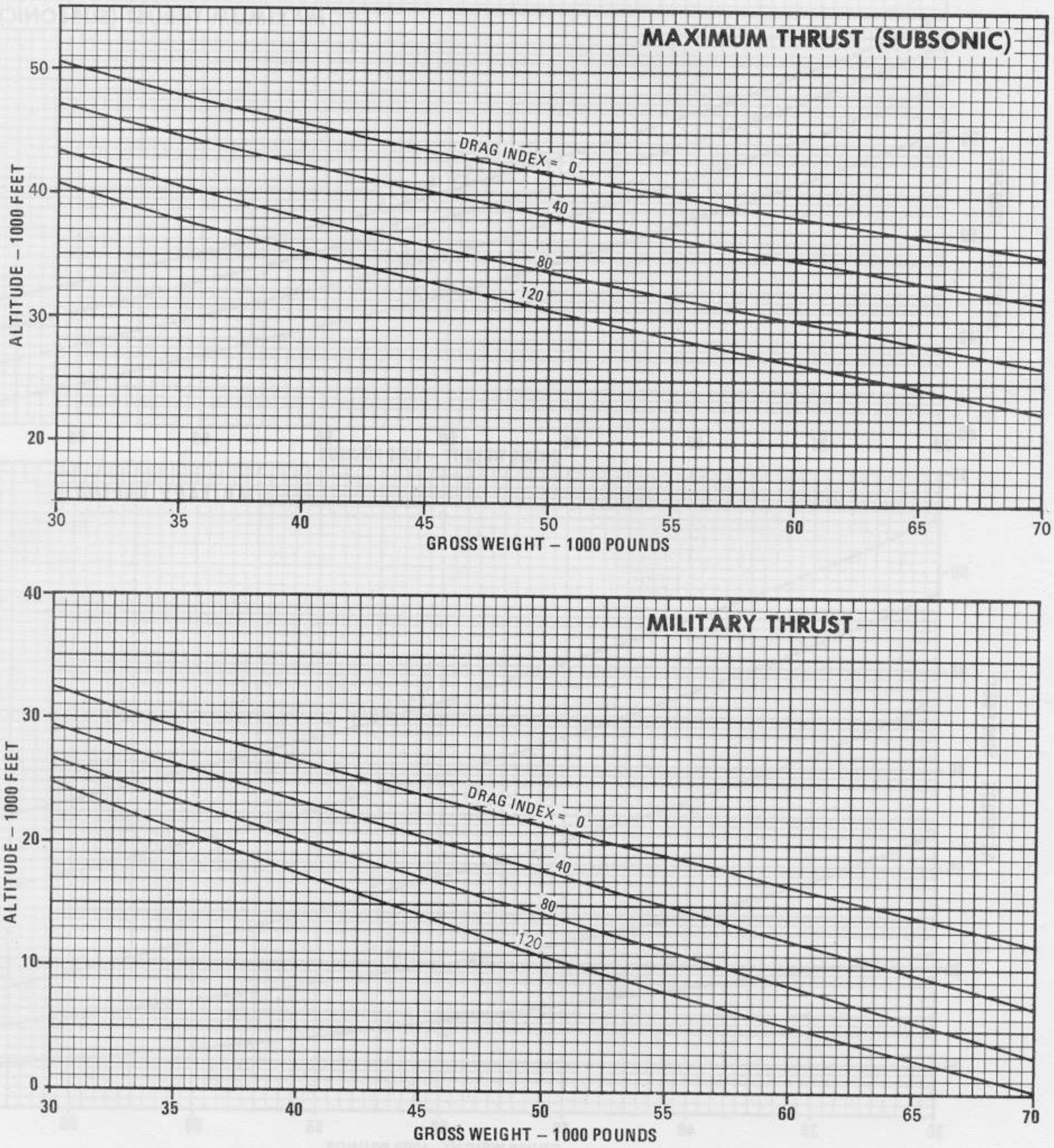
REMARKS

EINGINES (S): (2) F-100-PW-100
U.S. STANDARD DAY, 1966

NOTE

- COMBAT CEILING IS THE PRESSURE ALTITUDE AT WHICH THE AIRCRAFT CAN CLIMB AT A MAXIMUM RATE OF 500 FEET PER MINUTE
- INOPERATIVE ENGINE WINDMILLING





15A–1–(199)D

Figure A4-8

PART 5

RANGE

TABLE OF CONTENTS

Charts

Optimum Long Range Cruise A5-5
Constant Altitude/Long Range Cruise A5-7
Constant Altitude Cruise A5-9
Low Altitude Cruise...................................... A5-20
High Altitude Cruise..................................... A5-29

OPTIMUM LONG RANGE CRUISE

These charts (figures A5-1 and A5-2) present cruise data for twin-engine and single engine operation. These charts depict cruise altitude, specific range (nautical miles per pound) and cruise Mach number for various gross weights and drag indexes.

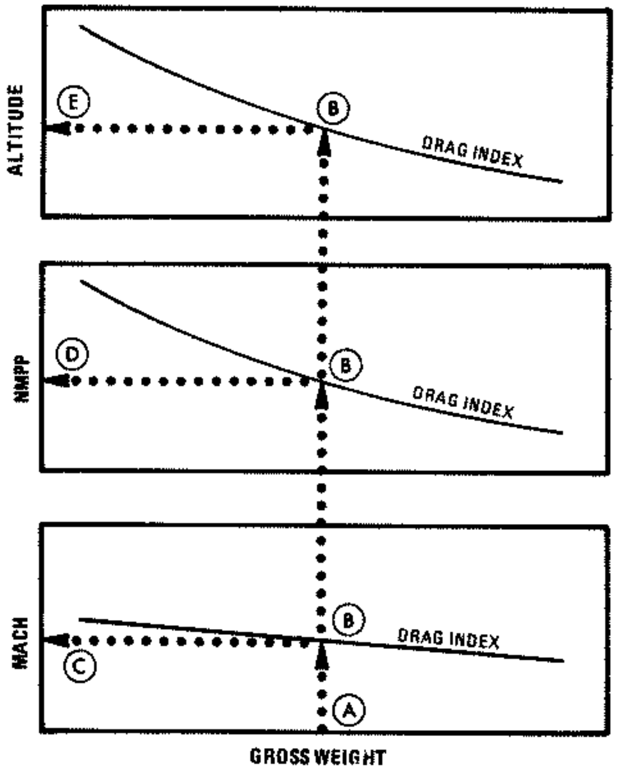
USE

Enter the chart with the applicable gross weight and project vertically up to intersect the appropriate drag index curves in each plot. From the intersection of the appropriate drag index curve, reflect horizontally left and read cruise Mach number, specific range in nautical miles per pound and cruise altitude.

Sample Problem

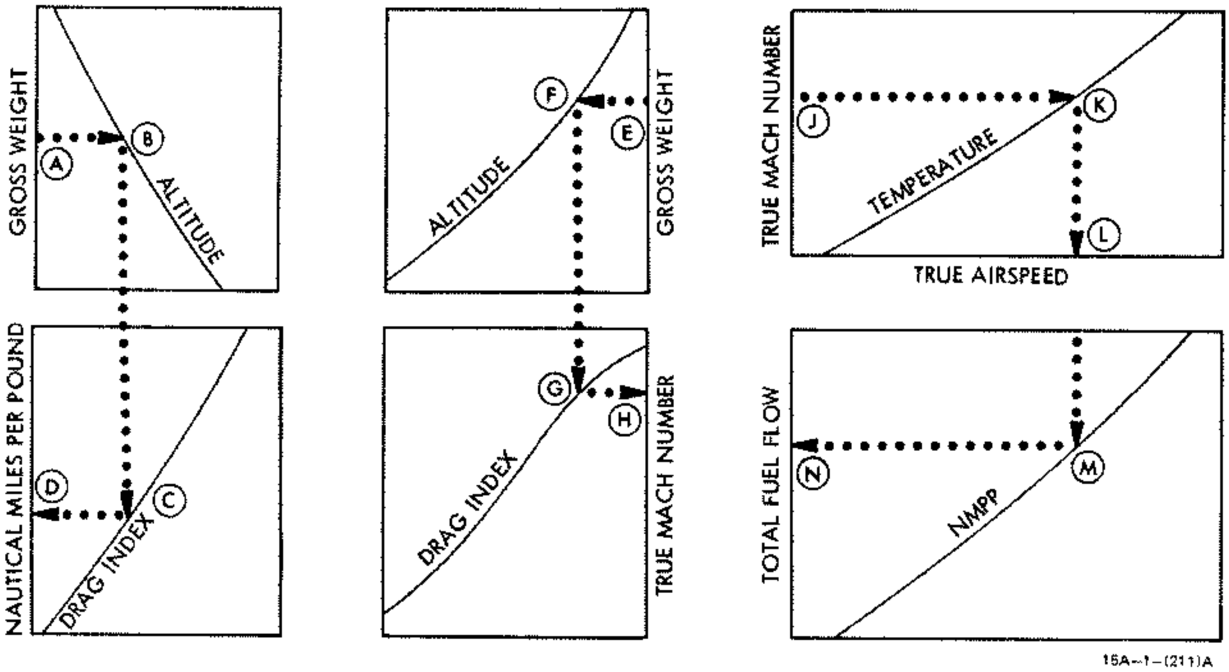
A. Gross weight	40,000 Lb
B. Drag index	20
C. Mach number	0.877 Mach
D. Specific range	0.114 NMPP
E. Cruise altitude	42,750 Ft

SAMPLE OPTIMUM LONG RANGE CRUISE



15A-1-(163)C

SAMPLE CONSTANT ALTITUDE/LONG RANGE CRUISE



CONSTANT ALTITUDE/LONG RANGE CRUISE

These charts (figure A5-3) present the necessary planning data to set up optimum cruise schedules for normal two-engine operation at a constant altitude. The recommended procedure is to use an average gross weight for a given leg of the mission. One way to find the average gross weight is to divide the mission into weight segments. With this method, readjust the cruise schedule each time a given amount of fuel is used. Subtract one-half of the fuel weight allotted for the first leg from the initial cruise gross weight. The remainder is the average gross weight for the leg. It is possible to obtain instantaneous data if desired.

USE

Enter the left side of sheet 1 with the average gross weight and project horizontally right to intersect the desired cruise altitude. From this point, project vertically down to the computed drag index, then horizontally left to obtain specific range (nautical miles per pound). To obtain optimum cruise Mach number for the desired altitude, enter the right side of sheet 1 with the average gross weight and project horizontally left to intersect the desired cruise altitude. From this point, project vertically down to the computed drag index, then horizontally right. Enter sheet 2 with the optimum cruise Mach number and project horizontally right to intersect predicted flight-level temperature, then vertically down to obtain corresponding true airspeed. Continue this projection vertically down to intersect the interpolated specific range (obtained from sheet 1), then horizontally left to obtain total fuel flow required in pounds per hour.

Sample Problem

(2) Engines

A. Average gross weight for first leg	40,000 Lb
B. Cruise altitude	30,000 Ft
C. Computed drag index	20

D. Specific range	0.097 NMPP
E. Gross weight	40,000 Lb
F. Altitude	30,000 Ft
G. Drag index	20
H. True Mach number	0.78
J. True Mach number	0.78
K. Temperature at flight altitude	−40°C
L. True airspeed	467 Kt
M. Specific range	0.097 NMPP
N. Total fuel flow	4815 PPH

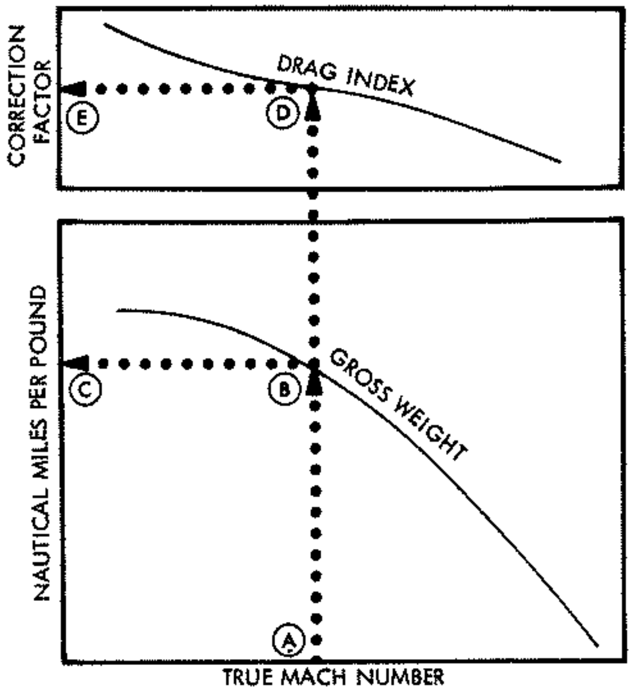
CONSTANT ALTITUDE CRUISE CHARTS

These charts (figures A5-4 thru A5-14) present planning data to set up constant altitude cruise schedules for normal two-engine operation at altitudes of sea level thru 50,000 feet in increments of 5000 feet. The charts depict specific range (nautical miles per pound of fuel) for various Mach numbers, gross weights and individual drag indexes. Also, depicted on the charts are maximum range, long range and maximum endurance lines.

USE

Enter the chart with the desired true Mach number and project vertically upward to intersect the appropriate gross weight curve, then horizontally to the left to determine specific range for a clean aircraft. From the true airspeed-gross weight intersection project vertically up to intersect the appropriate drag index curve, then horizontally left to determine the specific range correction factor. An optimum Mach number may also be determined by projecting vertically down from the appropriate gross weight-maximum range condition intersection to true Mach number.

SAMPLE CONSTANT ALTITUDE CRUISE



15A-1-(181)A

Sample Problem

Configuration - (4) AIM-7F Missiles, Altitude - 30,000 feet.

A. True Mach number	0.70
B. Gross weight	40,000 Lb
C. Specific range for a clean airplane	0.1045 NMPP
D. Drag index	7.2
E. Specific range correction factor	0.97
F. Corrected specific range (C X E)	0.1015 NMPP

LOW ALTITUDE CRUISE TABLES

These tables (figures A5-15 thru A5-21) present total fuel flow values for various combinations of cruise airspeed and drag index at altitudes of

Sea Level, 4000, 8000, 12,000 and 16,000 feet. Also included for each altitude are the total fuel flow values and resultant V_{max} (maximum attainable TAS) for a MIL thrust setting. Separate tables are provided for gross weights of 30,000 thru 70,000 pounds in 5000 pound increments. Fuel flow values are tabulated for U.S. Standard Day; however, correction factors are given for non-standard temperatures. The standard day temperature is listed with the altitude. If the actual temperature at a particular altitude differs from the standard day temperature, refer to the TEMP. EFFECTS column to determine the appropriate temperature correction factor.

USE

After selecting the applicable table for gross weight and altitude, determine the equivalent standard day true airspeed by dividing the desired true airspeed by the non-standard day temperature correction factor obtained from the appropriate TEMP. EFFECTS column. Enter the table with the equivalent standard day true airspeed and project horizontally to the applicable drag index column and read total fuel flow for a standard day. To obtain the total fuel flow at the desired true airspeed, multiply the total fuel flow for a standard day by the nonstandard day temperature correction factor.

Sample Problem

Gross weight 30,000 lbs, 16,000 ft (−16°C)

A. Desired airspeed	495 KTAS
B. Drag Index	20
C. Nonstandard day temperature	0°C
D. Correction factor	1.031
E. Equivalent standard day true airspeed (A ÷ D)	480 Kt
F. Standard day total fuel flow	7717 PPH
G. Total fuel flow at desired true airspeed (F X D)	7956 PPH
H. Standard day V_{max}	610.1 KTAS
J. Mil. Pwr. V_{max} factor	1.018
K. Nonstandard day V_{max} (H X J)	621.1 KTAS
L. Standard day Mil. Pwr. total fuel flow	18,287 PPH
M. Mil. Pwr. total fuel flow factor	.868
N. Nonstandard day Mil. Pwr. total fuel flow (M X L)	15,873 PPH

HIGH ALTITUDE CRUISE TABLES

These tables (figures A5-22 thru A5-30) present total fuel flow values for various combinatigns of cruise airspeed and drag index at altitudes of 20,000 feet thru 45,000 feet in 5000 foot increments. Also included for each altitude are the total fuel flow values and resultant V_{max} (maximum attainable TAS) for a MIL thrust setting. Separate charts are provided for gross weights of 30,000 thru 70,000 pounds in 5000 pound increments. Fuel flow values are tabulated for U.S. Standard Day; however, correction factors are given for nonstandard temperatures. The standard day temperature is listed with the altitude. If the actual temperature at a particular altitude differs from the standard day temperature, refer to the TEMP. EFFECTS column to determine the appropriate temperature correction factor.

USE

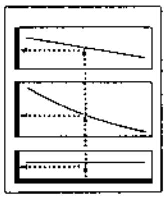
After selecting the applicable table for gross weight and altitude, determine the equivalent standard day true airspeed by dividing the desired true airspeed by the nonstandard day temperature correction factor obtained from the appropriate TEMP EFFECTS column. Enter the table with the equivalent standard day true airspeed and project horizontally to the applicable drag index column and read total fuel flow for a standard day. To obtain the total fuel flow at the desired true airspeed, multiply the total fuel flow for a standard day by the nonstandard day temperature correction factor.

OPTIMUM LONG RANGE CRUISE

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS

ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966



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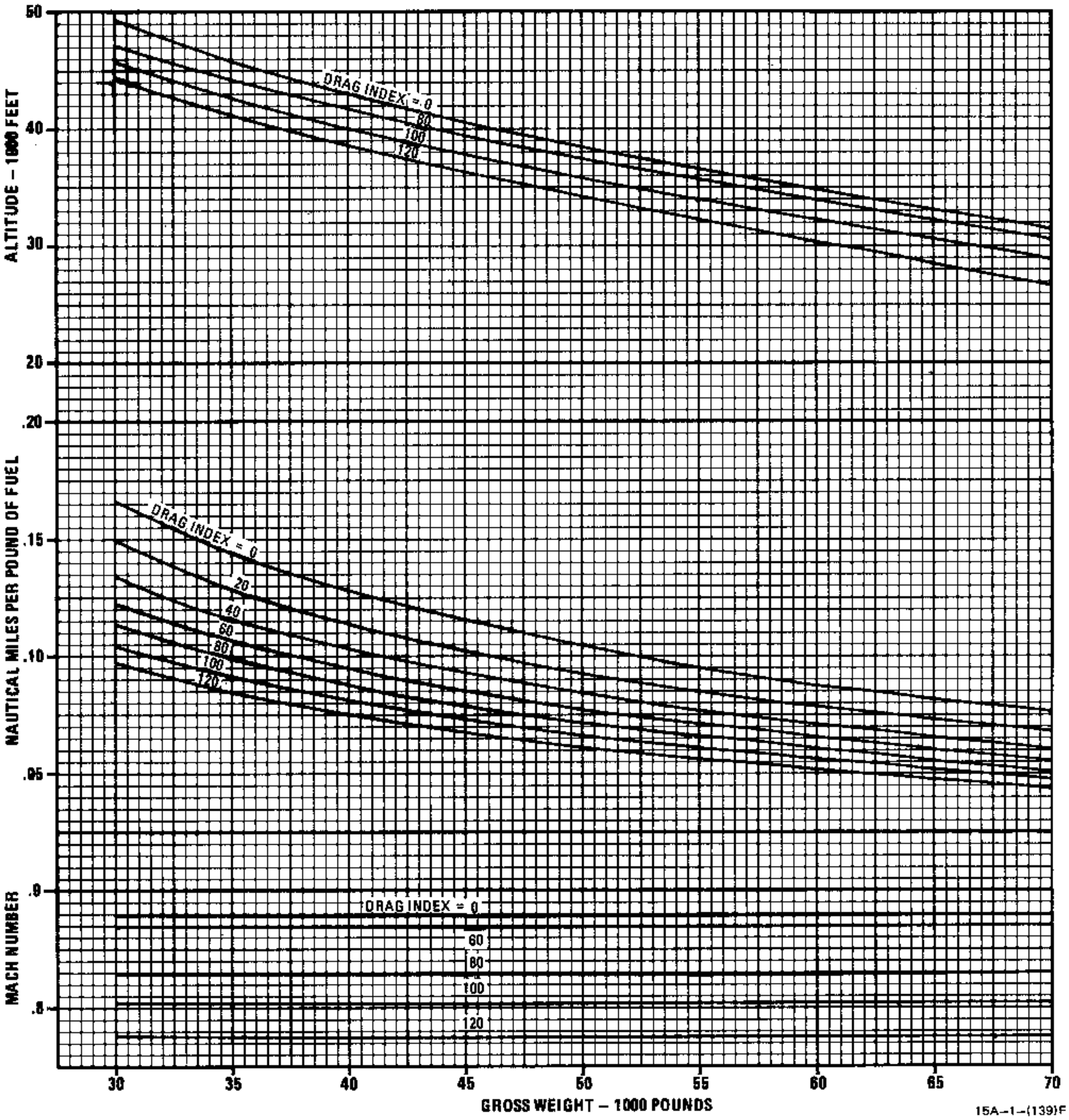


15A–1–(139)F

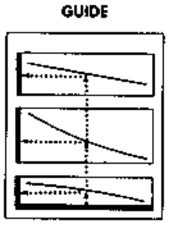
Figure A5-1.

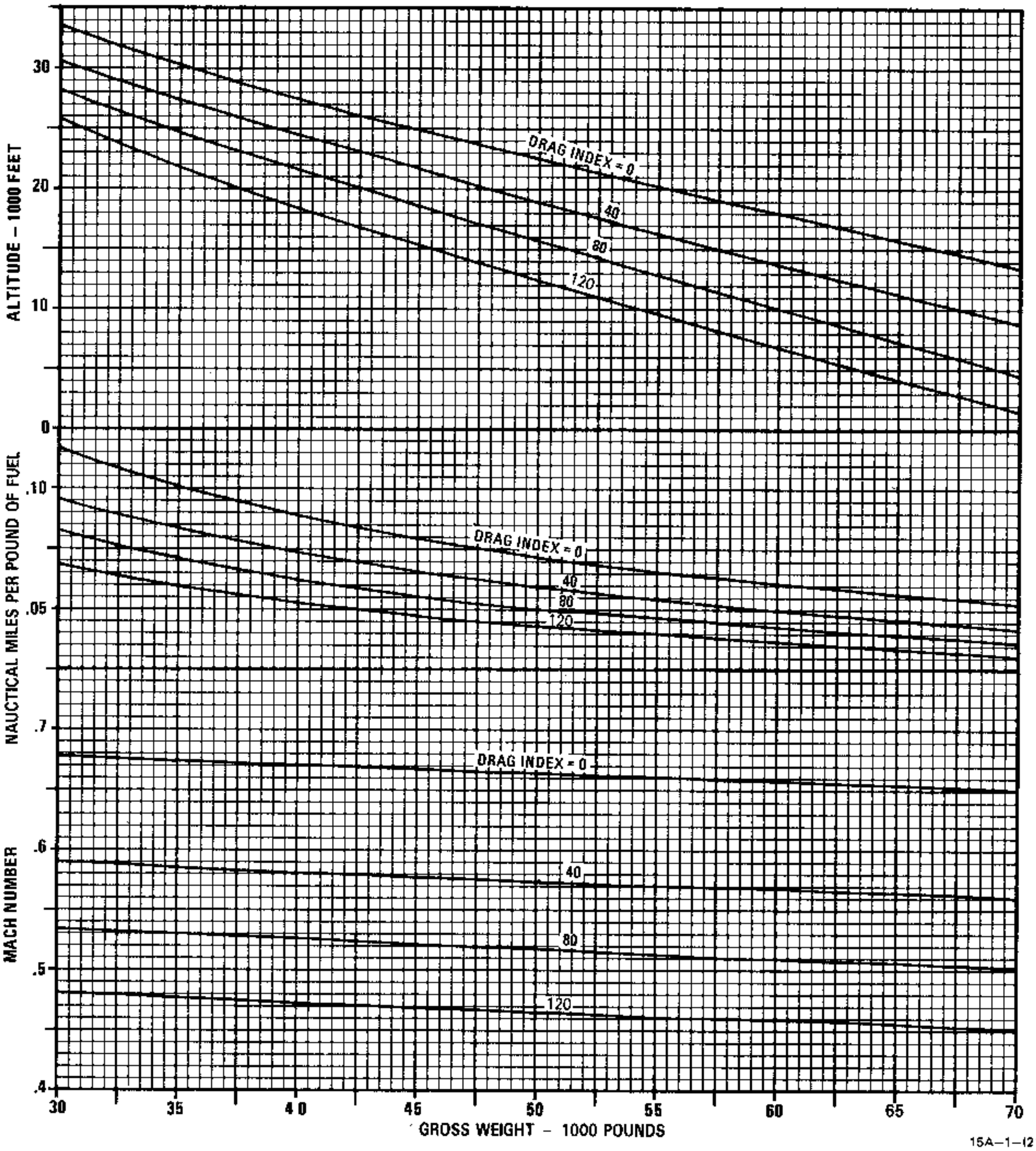
OPTIMUM LONG RANGE CRUISE
ONE ENGINE OPERATING

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINE(S): (2) F-100-PW-100
U.S. STANDARD DAY, 1966

DATE: 24 JANUARY 1984
DATA BASIS: **FLIGHT TEST**



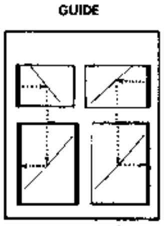


15A–1–(213)B

Figure A5-2

CONSTANT ALTITUDE/LONG RANGE CRUISE

SPECIFIC RANGE, TRUE MACH NUMBER



AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINE(S): (2) F-100-PW-100
U.S. STANDARD DAY, 1966

DATE: 24 JAN 1984
DATA BASIS: **FLIGHT TEST**

NOTE
DATA IS FOR ALL FREE AIR TEMPERATURES

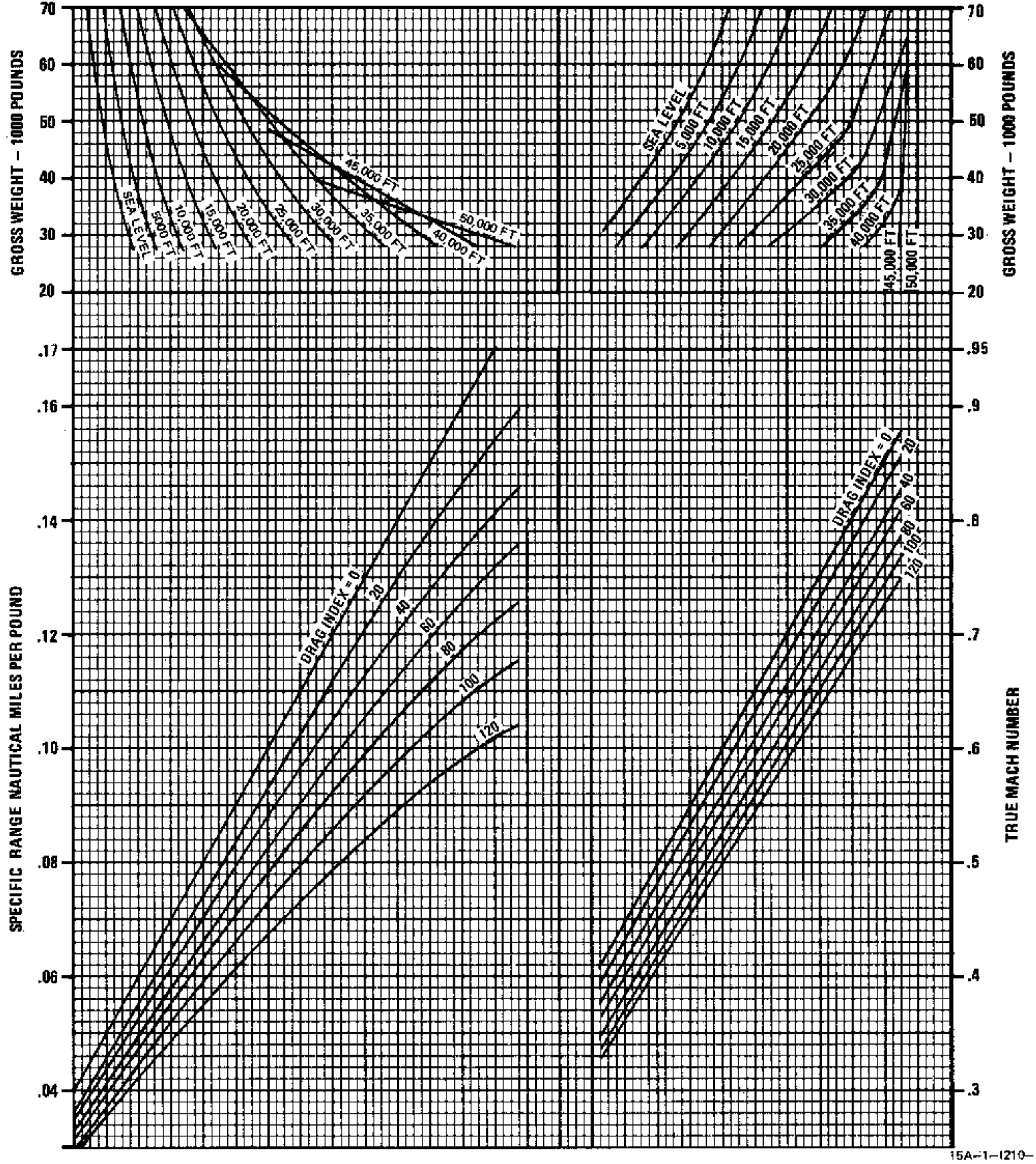


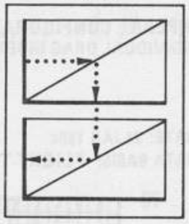
Figure A5-3 (Sheet 1 of 2)

CONSTANT ALTITUDE/LONG RANGE CRUISE

TRUE AIRSPEED AND FUEL FLOW

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINE(S): (2) F-100-PW-100
U.S. STANDARD DAY, 1966



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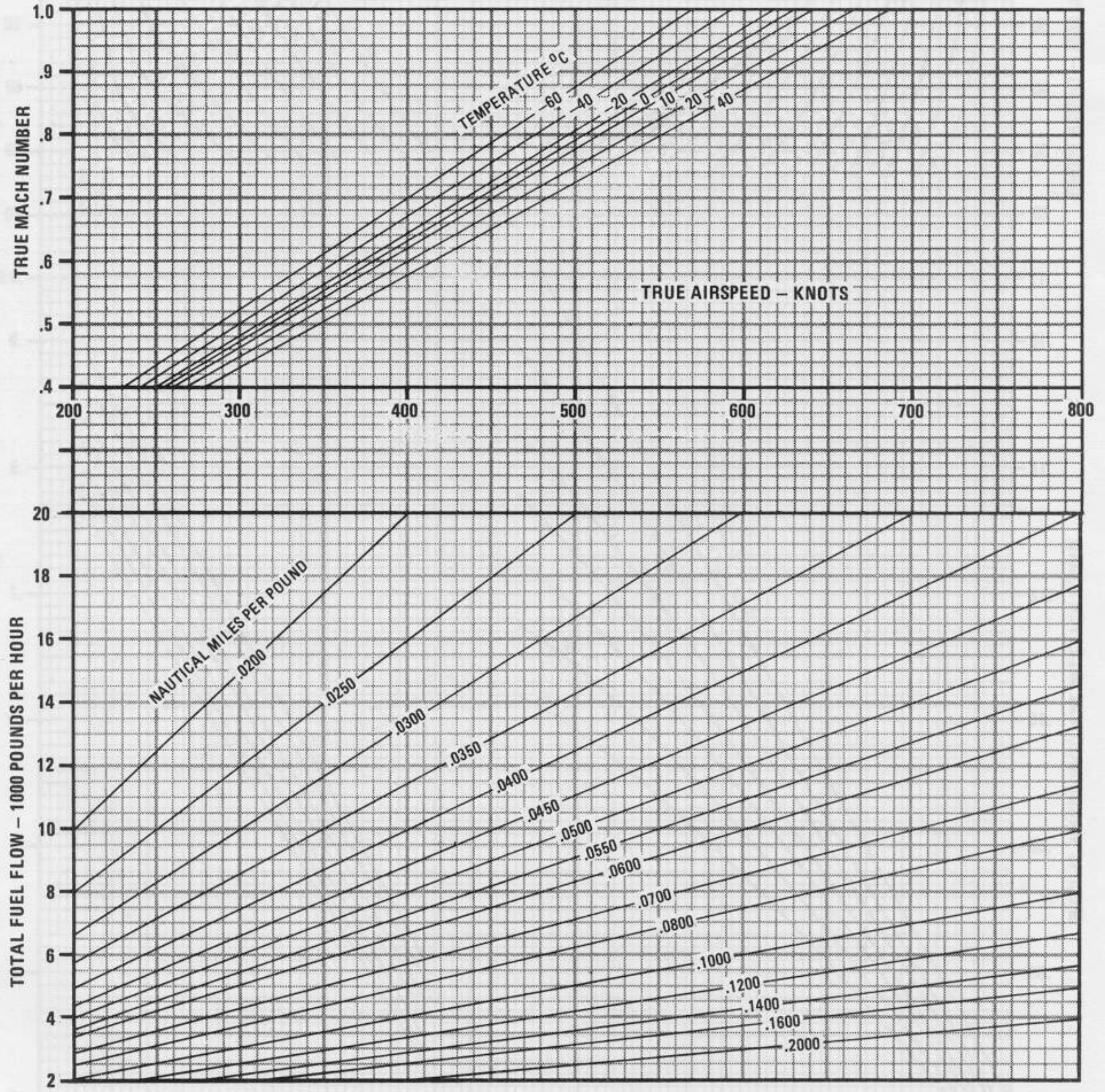


15A-1-(210-2)

Figure A5-3 (Sheet 2)

CONSTANT ALTITUDE CRUISE
SEA LEVEL

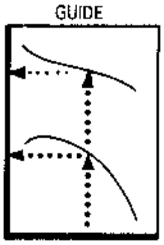
AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

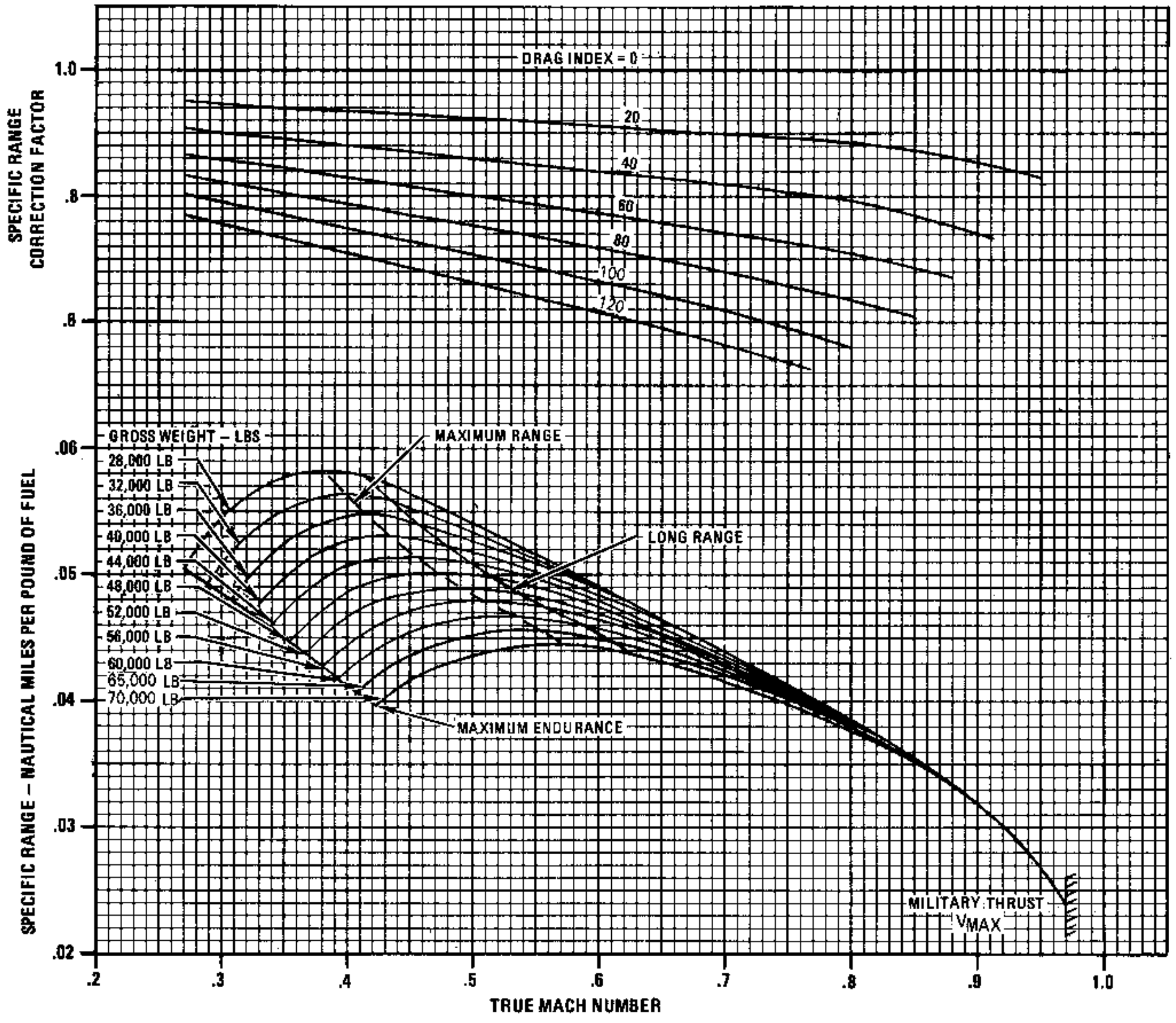
SPECIFIC RANGE, TRUE MACH NUMBER

REMARKS
ENGINE(S): (2)F100–PW–100

NOTE
DATA IS FOR ALL
FREE AIR TEMPERATURES

DATE: 24 JAN 1984
DATA BASIS: **FLIGHT TEST**



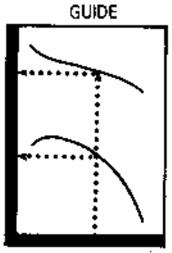


15A–1–(203)B

Figure A5-4

CONSTANT ALTITUDE CRUISE
5,000 FEET

SPECIFIC RANGE, TRUE MACH NUMBER

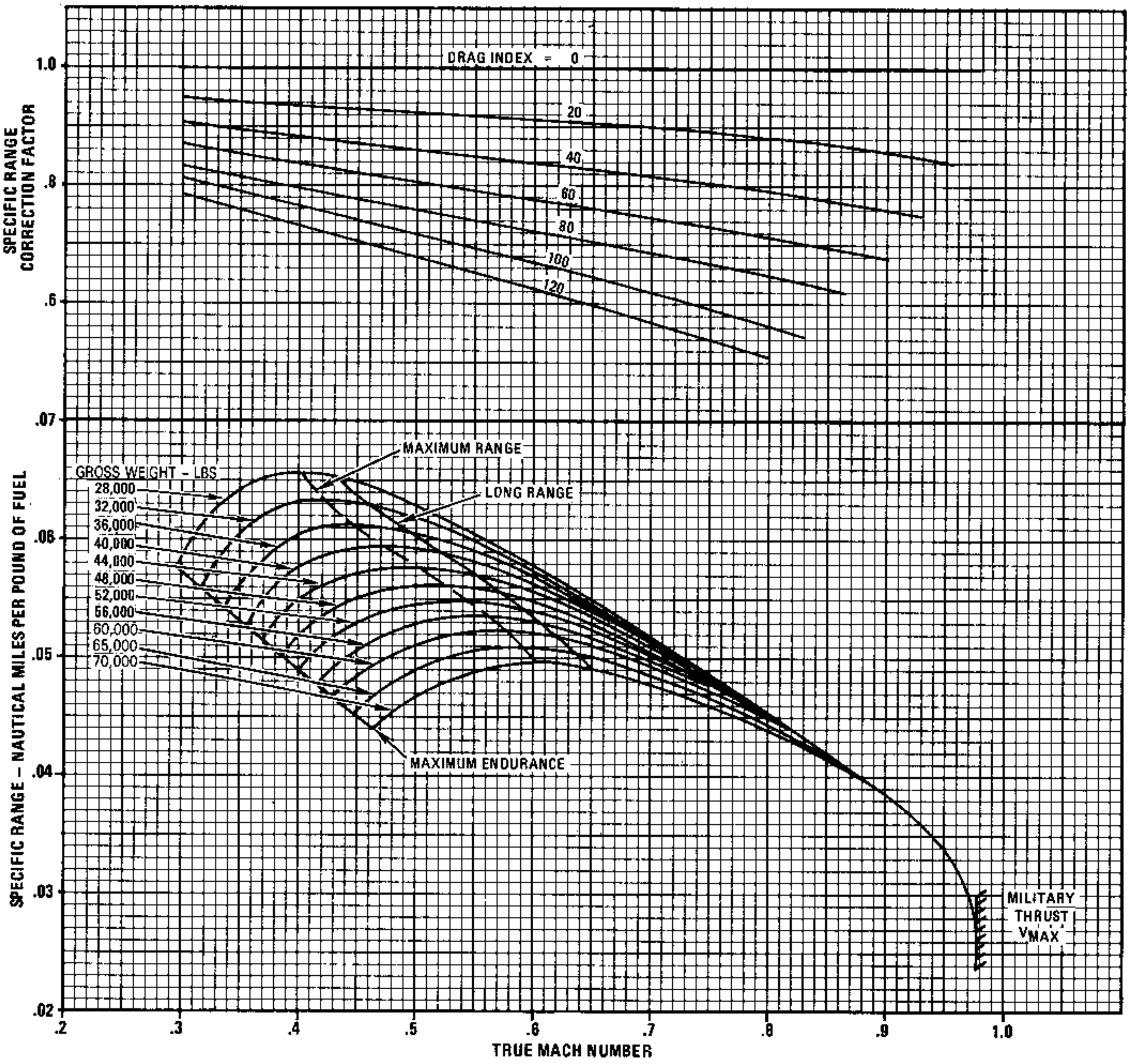


AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINE(S): (2) F100–PW–100

NOTE
DATA IS FOR ALL FREE AIR TEMPERATURES

DATE: 24 JAN 1984
DATA BASIS: **FLIGHT TEST**



15A–1–(177)B

Figure A5-5

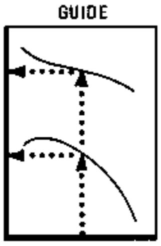
CONSTANT ALTITUDE CRUISE
10,000 FEET
SPECIFIC RANGE, TRUE MACH NUMBER

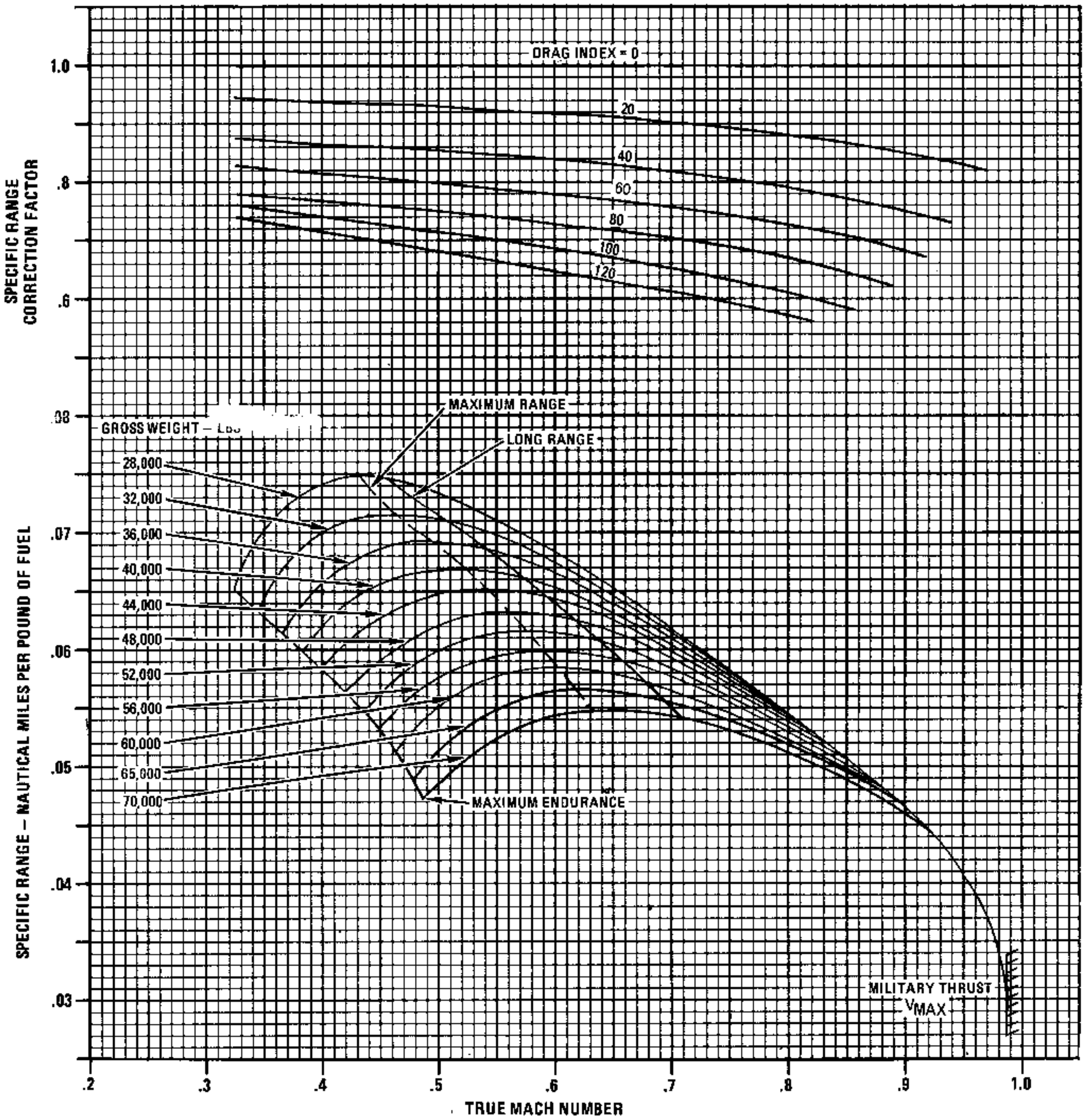
AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINE (S) (2) F100—PW—100

NOTE
DATA IS FOR ALL FREE
AIR TEMPERATURES

DATE: 24 JAN 1984
DATA BASIS: **FLIGHT TEST**





15A–1–(204)A

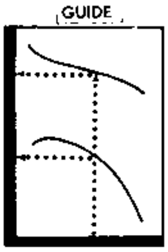
Figure A5-6

CONSTANT ALTITUDE CRUISE
15,000 FEET

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

SPECIFIC RANGE, TRUE MACH NUMBER

REMARKS
ENGINE(S): (2) F100–PW–100



DATE: 24 JAN 1984
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NOTE
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FREE AIR TEMPERATURES

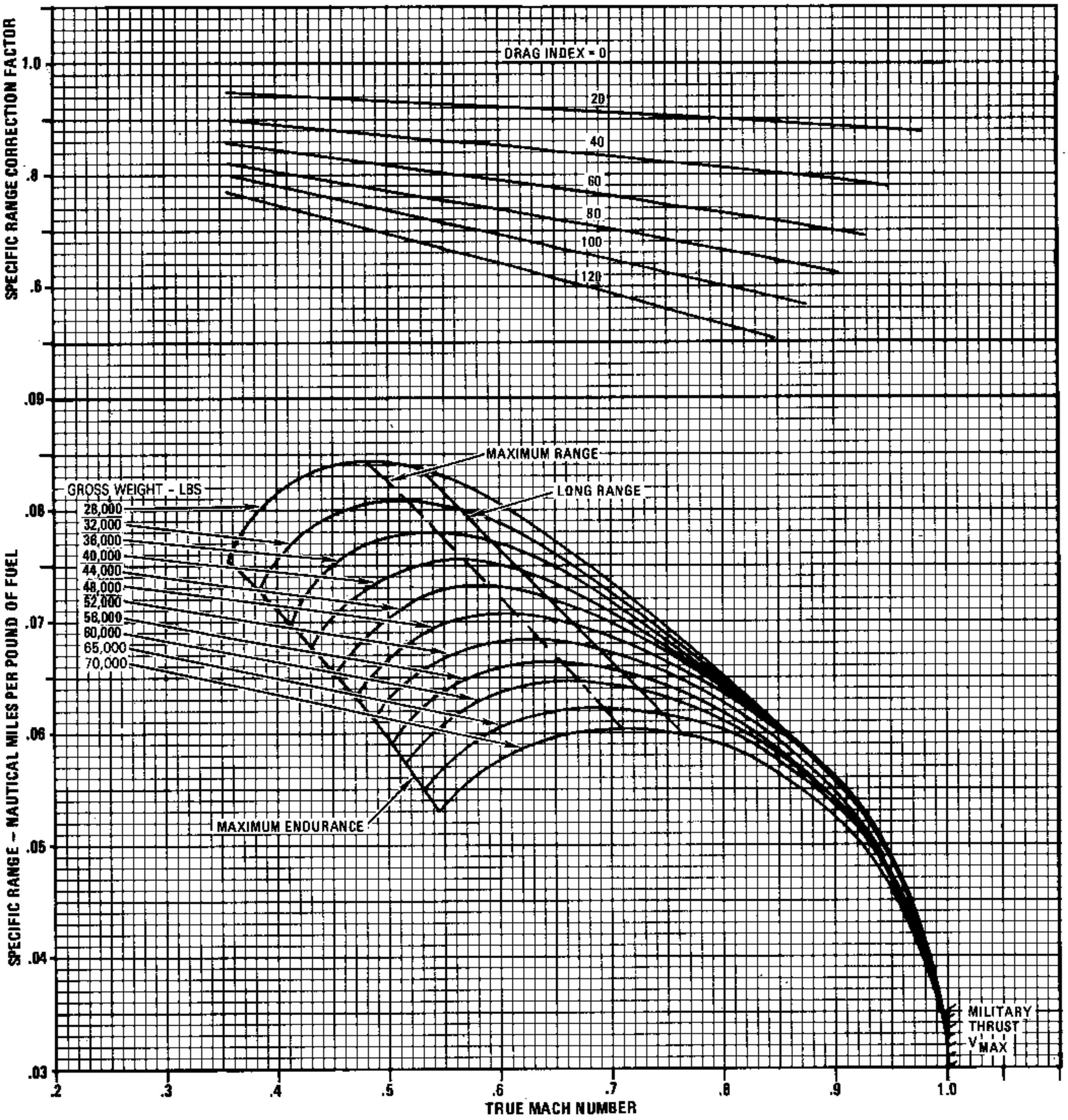


Figure A5-7

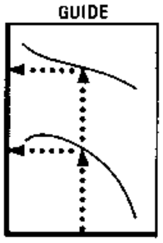
CONSTANT ALTITUDE CRUISE
20,000 FEET

SPECIFIC RANGE, TRUE MACH NUMBER

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINE(S): (2) F100–PW–100

NOTE
DATA IS FOR ALL FREE AIR TEMPERATURES



DATE: 24 JAN 1984
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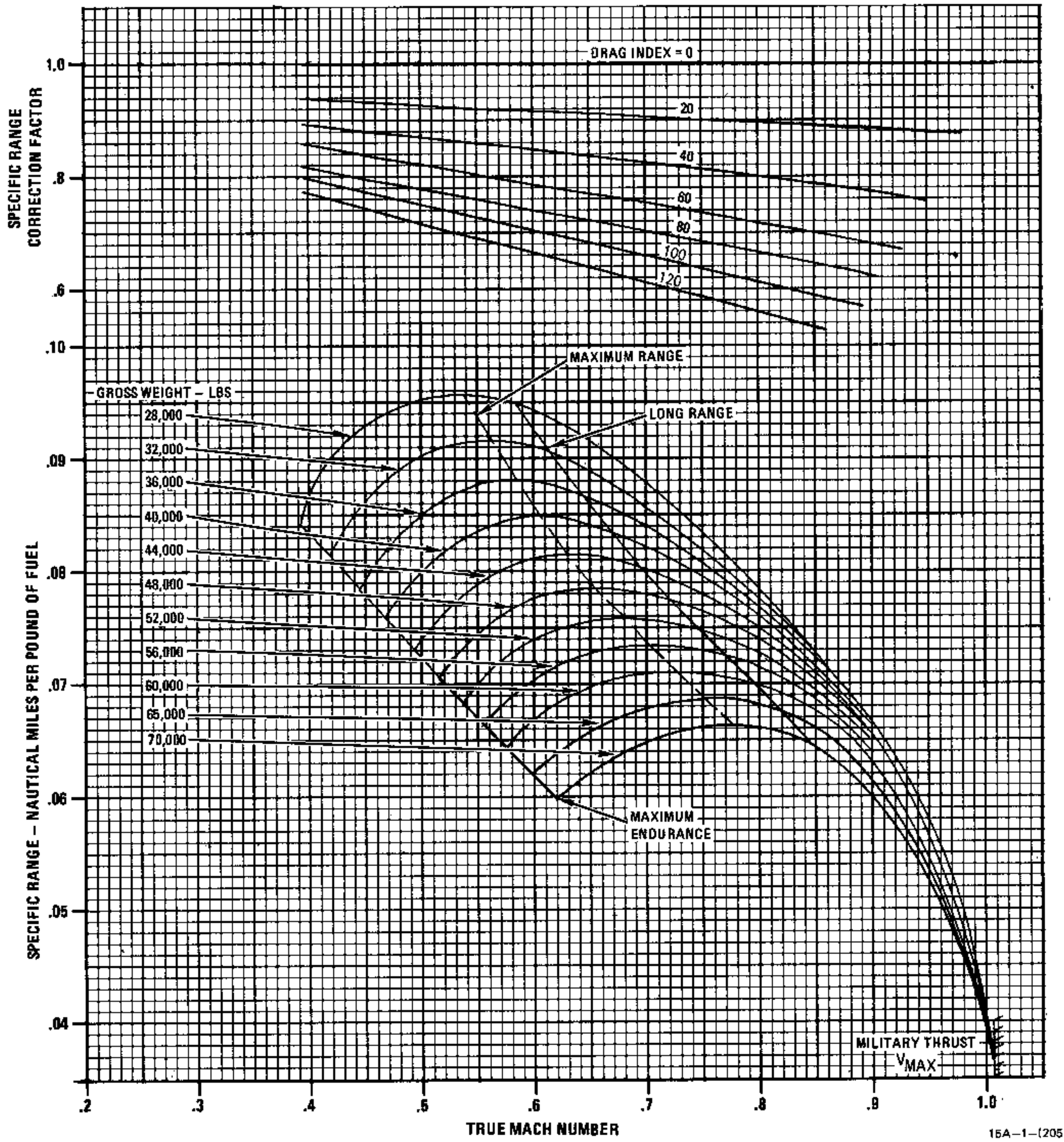

Figure A5-8

CONSTANT ALTITUDE CRUISE
25,000 FEET
SPECIFIC RANGE, TRUE MACH NUMBER

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINE(S): (2) F100–PW–100

NOTE
DATA IS FOR ALL
FREE AIR TEMPERATURES

DATE: 24 JAN 1984
DATA BASIS: **FLIGHT TEST**

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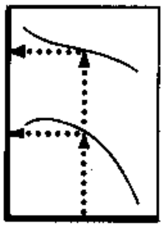


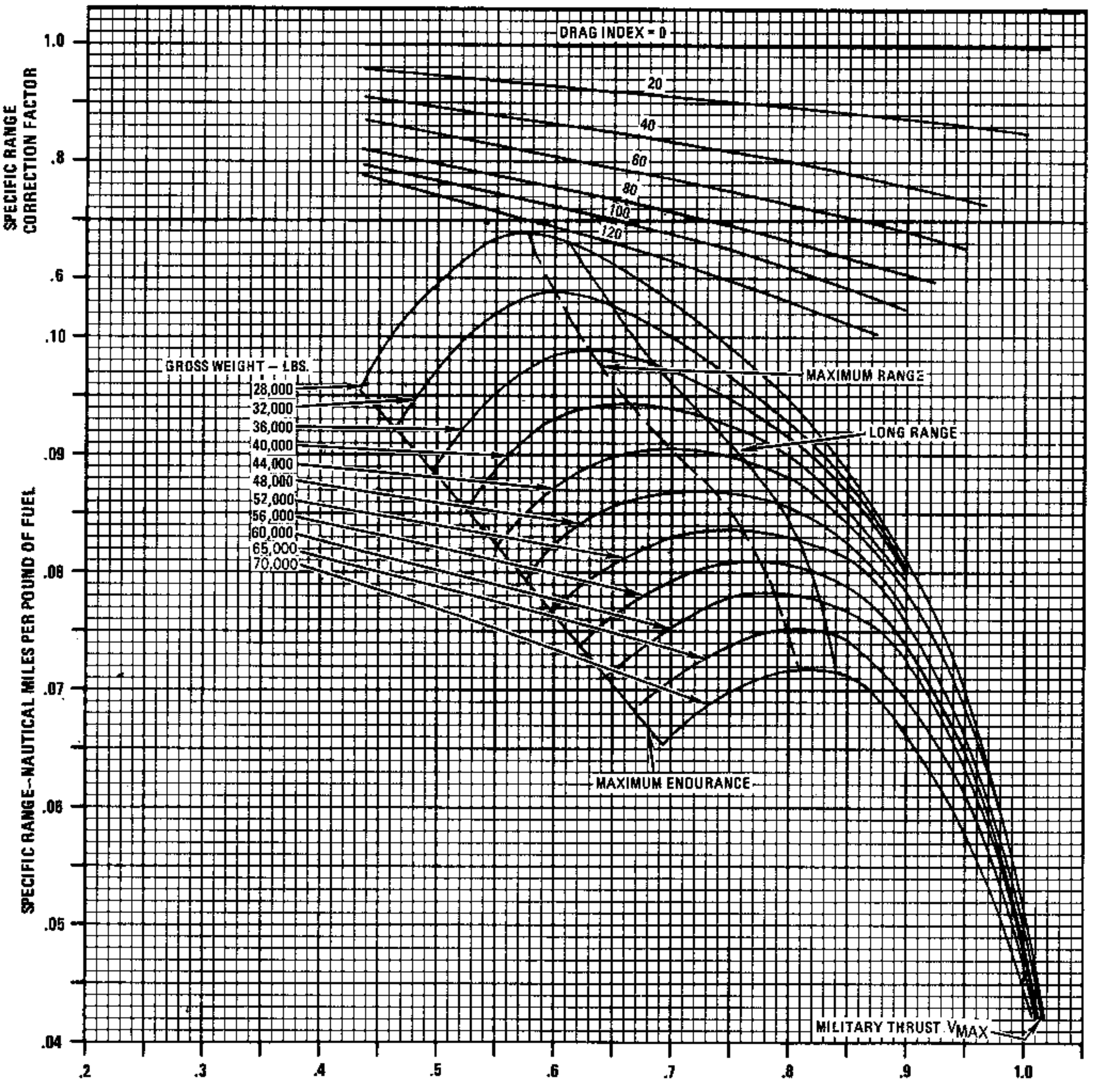


Figure A5-9

CONSTANT ALTITUDE CRUISE
30,000 FEET

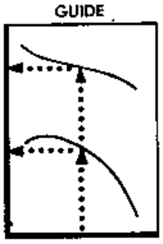
SPECIFIC RANGE, TRUE MACH NUMBER

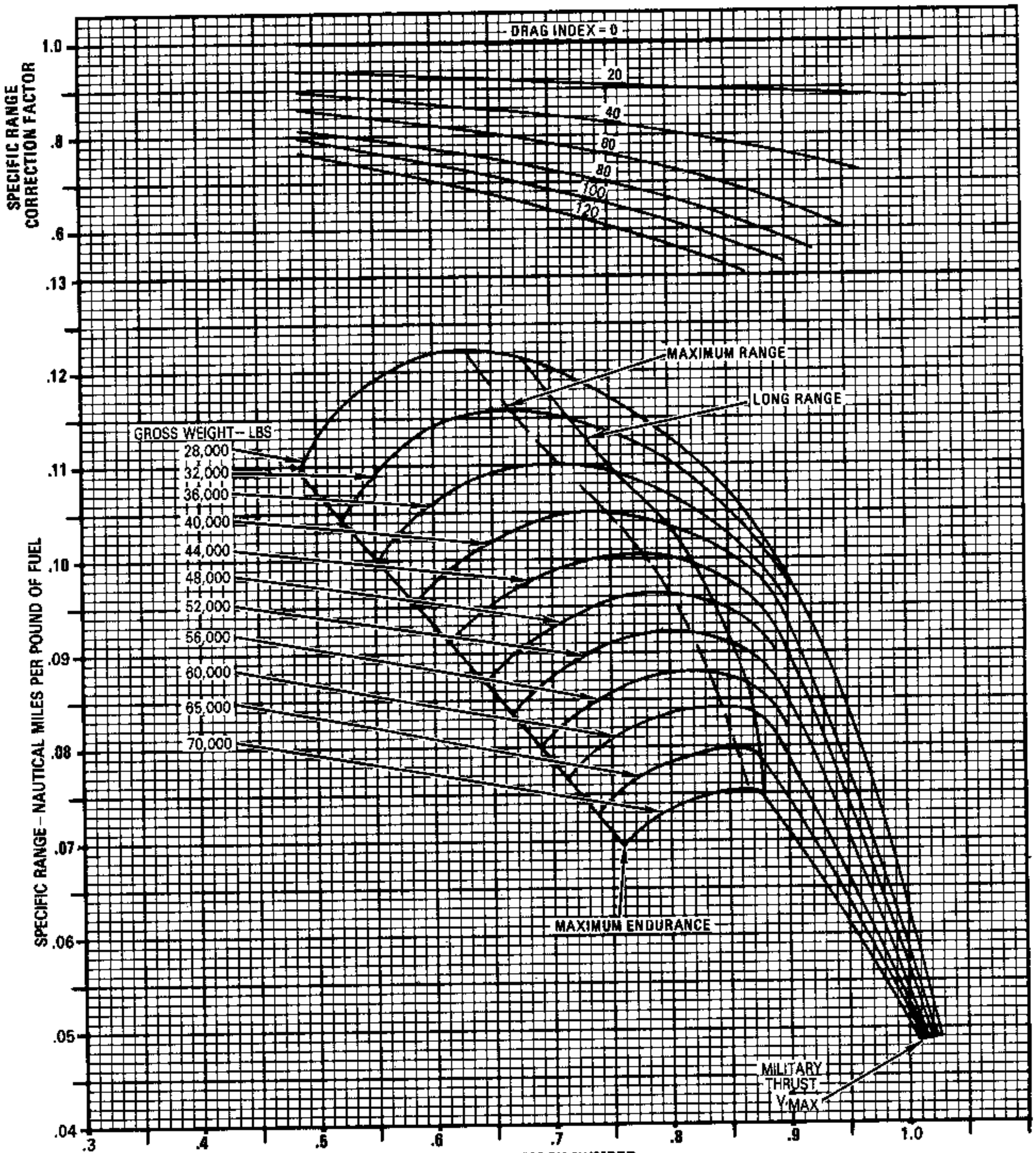
AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

DATE: 24 JAN 1984
DATA BASIS: FLIGHT TEST

REMARKS
ENGINE(S): (2) F100-PW-100

NOTE
DATA IS FOR ALL
FREE AIR TEMPERATURES





15A-1-(179)D

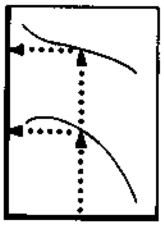
Figure A5-10

CONSTANT ALTITUDE CRUISE
35,000 FEET
SPECIFIC RANGE, TRUE MACH NUMBER

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINE(S): (2) F100–PW–100

NOTE
DATA IS FOR ALL
FREE AIR TEMPERATURES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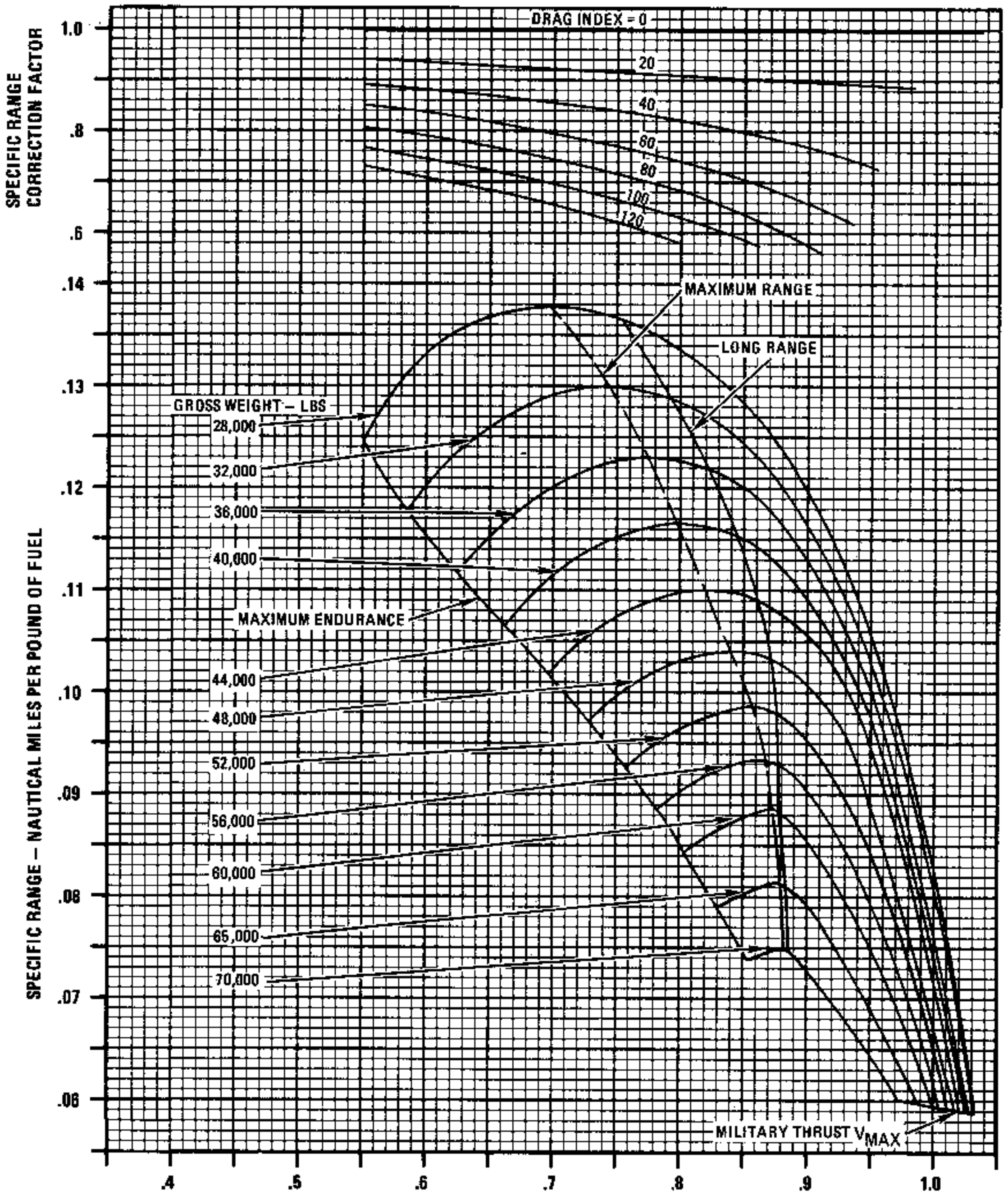


15A–1–(207)B

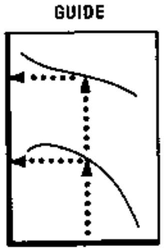
Figure A5-11

CONSTANT ALTITUDE CRUISE
40,000 FEET
SPECIFIC RANGE, TRUE MACH NUMBER

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINE(S): (2) F100–PW–100

NOTE
DATA IS FOR ALL
FREE AIR TEMPERATURES



DATE: 24 JAN 1984
DATA BASIS: **FLIGHT TEST**

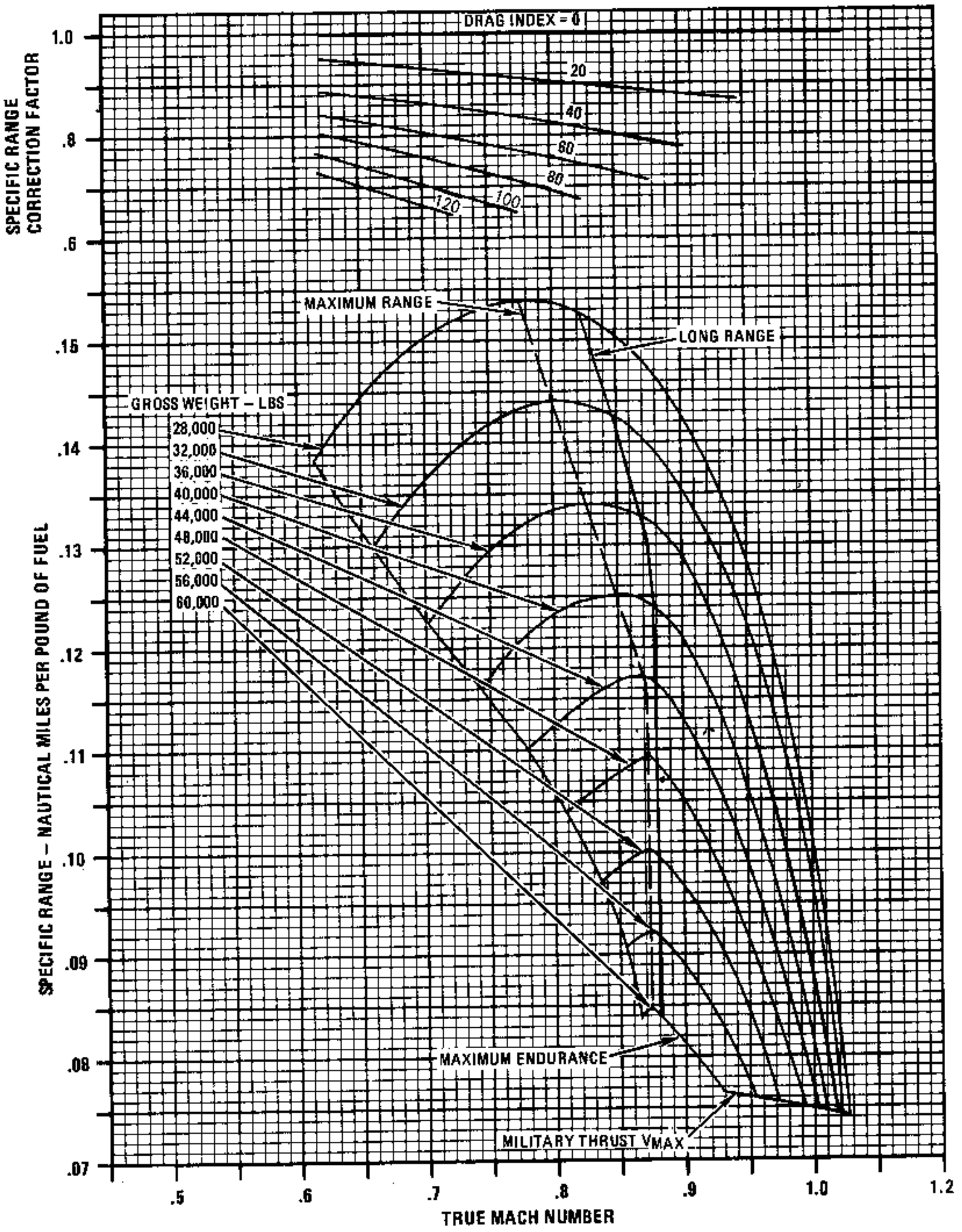


Figure A5-12

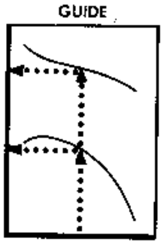
CONSTANT ALTITUDE CRUISE
45,000 FEET
SPECIFIC RANGE, TRUE MACH NUMBER

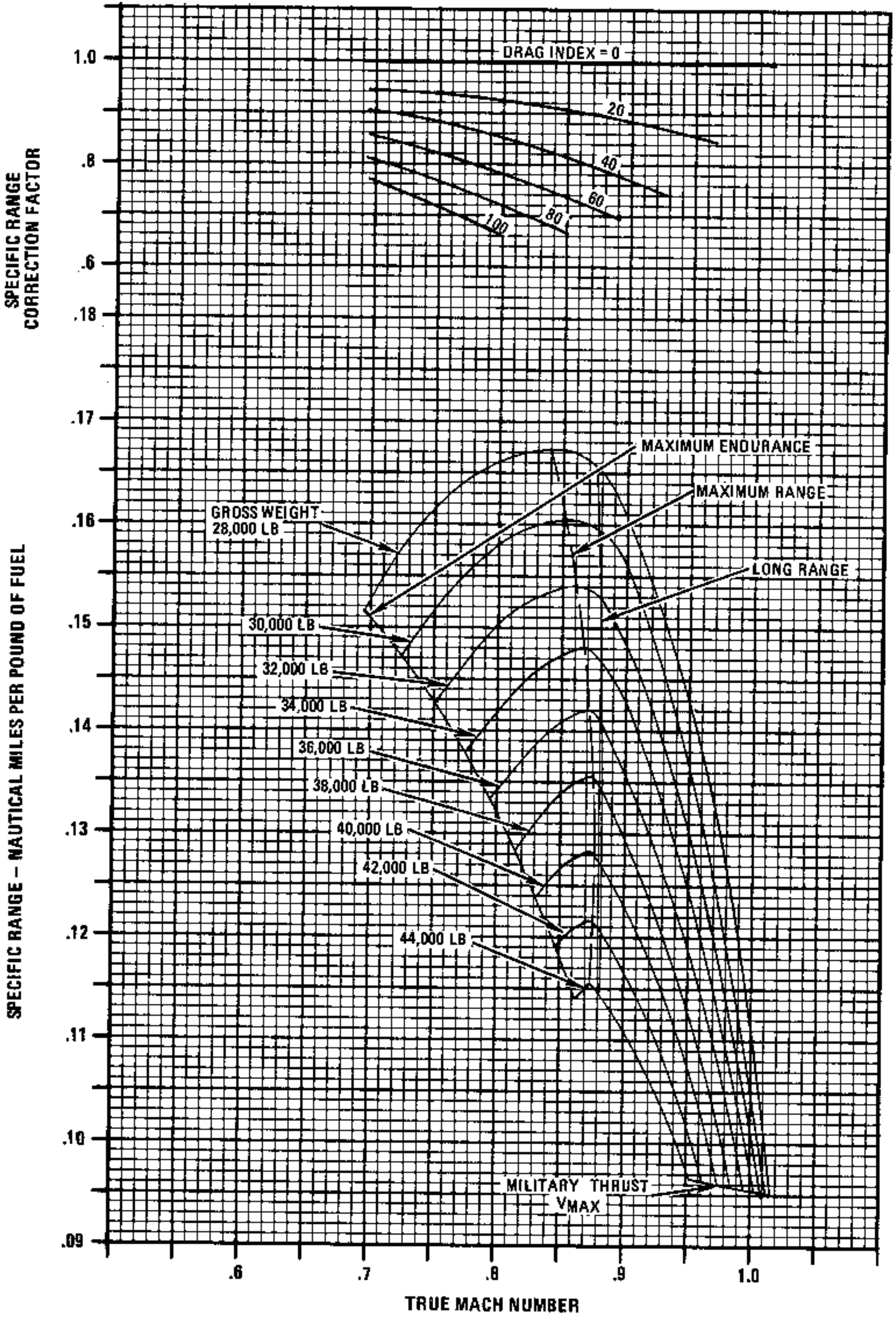
AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

DATE: 24 JAN 1984
DATA BASIS: **FLIGHT TEST**

REMARKS
ENGINE(S): (2) F100-PW-100

NOTE
DATA IS FOR ALL
FREE AIR TEMPERATURES





15A-1-(180)B

Figure A5-13

CONSTANT ALTITUDE CRUISE
50,000 FEET
SPECIFIC RANGE, TRUE MACH NUMBER

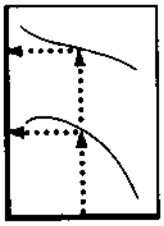
AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

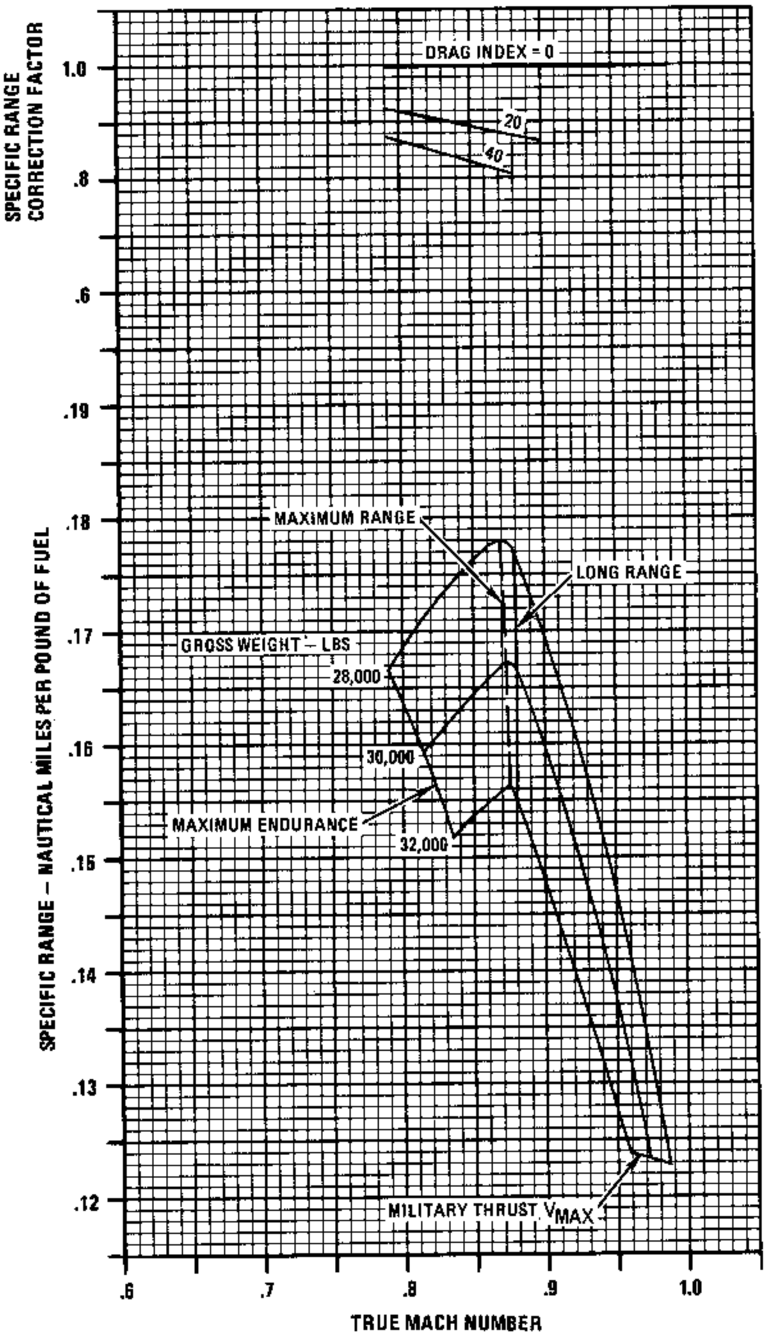
REMARKS
ENGINE(S): (2) F100–PW–100

NOTE
DATA IS FOR ALL
FREE AIR TEMPERATURES

DATE: 24 JAN 1984
DATA BASIS: **FLIGHT TEST**

GUIDE





15A–1–(208)A

Figure A5-14

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

LOW ALTITUDE CRUISE
GROSS WEIGHT - 30,000 POUNDS

DATE: 24 JAN 1984
DATA BASIS: FLIGHT TEST

REMARKS
ENGINES: (2) F100–PW–100

	KTAS	DRAG INDEX 0	TOTAL FUEL FLOW–LB/HR					
			20	40	60	80	100	120
SEA LEVEL (15°C)	360	6995	7651	8307	8963	9657	10355	11052
	400	8227	9052	9907	10792	11677	12569	13570
	440	9713	10807	11927	13047	14312	15591	16883
	480	11410	12818	14292	15914	17547	19272	20997
	520	13280	15149	17203	19335	21525	23716	
	560	15700	18367	21137	23949			
	600	18980	22655	26379				
	660							
	MIL	26866	26544	26306	25837	25393	24971	24656
	V_{MAX}	632.9	615.7	602.9	578.6	555.3	531.4	511.2
4000 FEET (7°C)	360	6187	6762	7336	7918	8527	9135	9743
	400	7291	8018	8780	9554	10327	11138	12000
	440	8599	9572	10553	11559	12658	13756	14911
	480	10069	11310	12636	14034	15487	17021	18563
	520	11707	13379	15146	17060	19010	20988	
	560	13947	16275	18787	21346			
	600	16571	19934	23384				
	660							
	MIL	24634	24385	24199	23854	23529	23132	22803
	V_{MAX}	629.3	614.6	603.0	581.7	562.0	538.8	519.7
8000 FEET (– 1°C)	360	5473	5974	6475	6991	7519	8046	8574
	400	6440	7079	7752	8425	9099	9823	10560
	440	7591	8447	9303	10202	11140	12079	13130
	480	8869	9959	11134	12332	13647	15005	16395
	520	10321	11806	13347	15078	16833	18623	20415
	560	12354	14404	16682	19039	21409		
	600	14840	17981	21192				
	660							
	MIL	22396	22190	22040	21775	21541	21267	20940
	V_{MAX}	626.4	613.2	602.5	582.6	565.2	545.1	525.8
12,000 FEET (– 9°C)	360	4856	5291	5726	6184	6642	7100	7559
	400	5681	6247	6835	7423	8020	8655	9291
	440	6688	7436	8184	8982	9791	10633	11546
	480	7806	8768	9804	10849	12024	13204	14451
	520	9095	10417	11805	13312	14895	16506	18135
	560	10947	12791	14817	16977	19151		
	600	13528	16474	19515				
	660							
	MIL	20349	20159	20000	19764	19573	19357	19088
	V_{MAX}	625.0	612.2	601.5	582.2	566.7	549.4	530.3
16,000 FEET (– 16°C)	360	4322	4697	5085	5483	5881	6278	6696
	400	5009	5513	6026	6540	7078	7630	8182
	440	5877	6533	7197	7901	8604	9357	10127
	480	6855	7717	8620	9559	10551	11591	12683
	520	8029	9195	10431	11727	13159	14618	16098
	560	9688	11331	13147	15109	17102		
	600	12701	15556					
	660							
	MIL	18491	18287	18091	17855	17693	17497	17226
	V_{MAX}	623.4	610.1	597.2	579.5	566.7	552.2	532.8

	ACTUAL OAT DEG. C	TEMP. EFFECTS–FACTORS		
		CRUISE	MIL	$V_{MAX.}$
SEA LEVEL (15°C)	–40	.899	1.062	.914
	–20	.937	1.040	.945
	0	.974	1.017	.977
	20	1.009	.995	1.008
	40	1.042	.832	1.021
4000 FEET (7°C)	–40	.912	1.156	.933
	–20	.951	1.087	.962
	0	.987	1.019	.991
	20	1.022	.915	1.011
	40	1.057	.774	1.024
8000 FEET (– 1°C)	–40	.925	1.262	.946
	–20	.964	1.124	.974
	0	1.002	.985	1.002
	20	1.037	.849	1.018
	40	1.072	.711	1.037
12,000 FEET (– 9°C)	–40	.939	1.271	.967
	–20	.979	1.100	.984
	0	1.017	.931	1.011
	20	1.054	.786	1.028
	40	1.088	.642	1.044
16,000 FEET (– 16°C)	–40	.953	1.175	.967
	–20	.992	1.024	.995
	0	1.031	.868	1.018
	20	1.067	.717	1.040
	40	1.105	.565	1.063

15A–1–(198)C

Figure A5-15

LOW ALTITUDE CRUISE

GROSS WEIGHT - 35,000 POUNDS

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINES: (2) F100–PW–100

DATE: 24 JAN 1984
DATA BASIS: **FLIGHT TEST**

	KTAS	DRAG INDEX 0	TOTAL FUEL FLOW–LB/HR					
			20	40	60	80	100	120
SEA LEVEL (15°C)	360	7047	7699	8351	9003	9695	10389	11082
	400	8270	9091	9944	10825	11705	12596	13583
	440	9756	10849	11965	13080	14344	15618	16907
	480	11406	12809	14277	15894	17519	19239	20958
	520	13266	15127	17175	19300	21483	23669	
	560	15663	18325	21085	23890			
	600	18948	22614					
	660							
	MIL	26872	26548	26309	25846	25405	24979	24663
	V_{MAX}	633.2	615.9	603.1	579.0	555.9	531.9	511.7
4000 FEET (7°C)	360	6257	6828	7398	7980	8584	9188	9792
	400	7333	8056	8817	9586	10355	11166	12022
	440	8641	9613	10590	11595	12689	13783	14935
	480	10098	11335	12659	14051	15501	17029	18565
	520	11692	13356	15118	17023	18965	20938	
	560	13935	16257	18760	21312			
	600	16544	19896	23337				
	660							
	MIL	24640	24389	24202	23860	23533	23141	22812
	V_{MAX}	629.7	614.8	603.2	582.0	562.3	539.3	520.2
8000 FEET (−1°C)	360	5581	6078	6575	7093	7616	8140	8663
	400	6497	7134	7803	8473	9142	9866	10598
	440	7636	8487	9339	10236	11170	12104	13153
	480	8914	10000	11174	12367	13680	15032	16418
	520	10331	11812	13347	15072	16821	18604	20390
	560	12352	14394	16665	19014	21377		
	600	14834	17966	21168				
	660							
	MIL	22400	22193	22041	21778	21544	21273	20944
	V_{MAX}	626.7	613.4	602.6	582.9	565.4	545.4	526.1
12,000 FEET (−9°C)	360	4987	5417	5856	6309	6763	7217	7681
	400	5758	6325	6908	7492	8090	8721	9352
	440	6735	7479	8222	9019	9823	10664	11572
	480	7851	8812	9843	10887	12056	13232	14473
	520	9135	10454	11841	13342	14920	16525	18147
	560	10952	12790	14808	16960	19127		
	600	13511	16447	19478				
	660							
	MIL	20352	20162	20002	19767	19575	19359	19088
	V_{MAX}	625.2	612.4	601.7	582.5	566.9	549.6	530.3
16,000 FEET (−16°C)	360	4478	4849	5242	5636	6030	6424	6847
	400	5130	5638	6148	6658	7200	7747	8295
	440	5949	6601	7264	7963	8663	9415	10181
	480	6900	7760	8658	9595	10581	11619	12705
	520	8069	9230	10463	11756	13181	14634	16108
	560	9706	11344	13154	15108	17093		
	600	12683	15524					
	660							
	MIL	18495	18290	18096	17857	17694	17498	17226
	V_{MAX}	623.7	610.3	597.5	579.7	566.8	552.3	532.9

ACTUAL OAT DEG. C	TEMP. EFFECTS–FACTORS		
	CRUISE	MIL	$V_{MAX.}$
-40	.899	1.062	.914
-20	.937	1.040	.945
0	.974	1.017	.977
20	1.009	.995	1.008
40	1.042	.832	1.021
-40	.912	1.156	.933
-20	.951	1.087	.962
0	.987	1.019	.991
20	1.022	.915	1.011
40	1.057	.774	1.024
-40	.925	1.262	.946
-20	.964	1.124	.974
0	1.002	.985	1.002
20	1.037	.849	1.018
40	1.072	.711	1.037
-40	.939	1.271	.967
-20	.979	1.100	.984
0	1.017	.931	1.011
20	1.054	.786	1.028
40	1.088	.642	1.044
-40	.953	1.175	.967
-20	.992	1.024	.995
0	1.031	.868	1.018
20	1.067	.717	1.040
40	1.105	.565	1.063

15A–1–(197)C

Figure A5-16

LOW ALTITUDE CRUISE
GROSS WEIGHT - 40,000 POUNDS

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

DATE: 24 JAN 1984
DATA BASIS: **FLIGHT TEST**

REMARKS
ENGINES: (2) F100-PW-100

	KTAS	DRAG INDEX	TOTAL FUEL FLOW–LB/HR					
		0	20	40	60	80	100	120
SEA LEVEL (15°C)	360	7118	7766	8414	9064	9753	10443	11132
	400	8312	9129	9981	10857	11734	12624	13616
	440	9799	10891	12002	13113	14377	15646	16930
	480	11446	12845	14313	15924	17546	19260	20974
	520	13253	15106	17148	19264	21442	23621	
	560	15644	18299	21051	23850			
	600	18935	22592	26300				
	660							
	MIL	26877	26551	26311	25852	25413	24987	24669
	V_{MAX}	633.4	616.1	603.2	579.3	556.4	532.4	512.0
4000 FEET (7°C)	360	6377	6944	7510	8094	8694	9294	9894
	400	7395	8113	8874	9639	10404	11214	12066
	440	8684	9654	10626	11631	12720	13809	14958
	480	10144	11376	12700	14087	15535	17057	18588
	520	11713	13374	15130	17030	18966	20932	
	560	13923	16238	18733	21277			
	600	16544	19888	23320				
	660							
	MIL	24644	24391	24203	23863	23538	23145	22814
	V_{MAX}	629.9	615.0	603.3	582.2	562.5	539.5	520.3
8000 FEET (−1°C)	360	5715	6208	6702	7222	7741	8260	8780
	400	6579	7217	7882	8547	9213	9938	10666
	440	7686	8533	9380	10277	11206	12135	13182
	480	8959	10040	11213	12402	13714	15060	16440
	520	10374	11854	13389	15107	16851	18628	20407
	560	12358	14393	16658	18999	21355		
	600	14827	17950	21145				
	660							
	MIL	22403	22195	22043	21780	21546	21274	20943
	V_{MAX}	626.9	613.6	602.8	583.0	665.6	545.5	526.0
12,000 FEET (−9°C)	360	5148	5575	6018	6468	6917	7367	7839
	400	5882	6452	7031	7611	8214	8841	9467
	440	6809	7548	8288	9085	9884	10728	11630
	480	7896	8855	9881	10925	12088	13261	14496
	520	9176	10493	11880	13374	14948	16546	18161
	560	10970	12803	14815	16959	19118		
	600	13520	16447	19469				
	660							
	MIL	20355	20163	20002	19768	19576	19360	19087
	V_{MAX}	625.4	612.5	601.7	582.6	566.9	549.7	530.2
16,000 FEET (−16°C)	360	4644	5021	5411	5800	6190	6593	7012
	400	5267	5773	6279	6788	7331	7874	8417
	440	6064	6711	7379	8073	8767	9525	10285
	480	6967	7827	8721	9658	10639	11677	12757
	520	8118	9273	10505	11796	13214	14662	16128
	560	9730	11365	13170	15116	17093		
	600	12734	15563					
	660							
	MIL	18496	18289	18093	17857	17694	17498	17225
	V_{MAX}	623.8	610.2	597.4	579.7	566.8	552.3	532.8

	ACTUAL OAT DEG. C	TEMP. EFFECTS–FACTORS		
		CRUISE	MIL	$V_{MAX.}$
SEA LEVEL (15°C)	−40	.899	1.062	.914
	−20	.937	1.040	.945
	0	.974	1.017	.977
	20	1.009	.995	1.008
	40	1.042	.832	1.021
4000 FEET (7°C)	−40	.912	1.156	.933
	−20	.951	1.087	.962
	0	.987	1.019	.991
	20	1.002	.915	1.011
	40	1.057	.774	1.024
8000 FEET (−1°C)	−40	.925	1.262	.946
	−20	.964	1.124	.974
	0	1.002	.985	1.002
	20	1.037	.849	1.018
	40	1.072	.711	1.037
12,000 FEET (−9°C)	−40	.939	1.271	.967
	−20	.979	1.100	.984
	0	1.017	.931	1.011
	20	1.054	.786	1.028
	40	1.088	.642	1.044
16,000 FEET (−16°C)	−40	.953	1.175	.967
	−20	.992	1.024	.995
	0	1.031	.868	1.018
	20	1.067	.717	1.040
	40	1.105	.565	1.063

15A–1–(196)C

Figure A5-17

LOW ALTITUDE CRUISE

GROSS WEIGHT - 45,000 POUNDS

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINES: (2) F100–PW–100

DATE: 24 JAN 1984
DATA BASIS: FLIGHT TEST

	KTAS	DRAG INDEX 0	TOTAL FUEL FLOW–LB/HR					
			20	40	60	80	100	120
SEA LEVEL (15°C)	360	7244	7889	8533	9186	9872	10557	11242
	400	8377	9189	10041	10914	11786	12678	13665
	440	9842	10932	12039	13146	14409	15673	16954
	480	11493	12887	14356	15962	17581	19288	20996
	520	13278	15130	17166	19278	21449	23622	
	560	15625	18274	21018	23809			
	600	18935	22584	26285				
	660							
	MIL	26882	26554	26312	25857	25420	24990	24669
	V_{MAX}	633.7	616.2	603.2	579.6	566.8	532.5	512.0
4000 FEET (7°C)	360	6513	7075	7638	8226	8822	9417	10013
	400	7477	8192	8953	9714	10475	11289	12136
	440	8732	9700	10667	11672	12756	13840	14987
	480	10190	11417	12741	14123	15568	17085	18611
	520	11759	13421	15172	17070	19000	20960	
	560	13928	16237	18724	21261	23823		
	600	16544	19880	23304				
	660							
	MIL	24647	24393	24204	23866	23540	23145	22811
	V_{MAX}	630.1	615.1	603.3	582.4	562.7	539.5	520.1
8000 FEET (−1°C)	360	5878	6368	6867	7382	7897	8412	8935
	400	6704	7345	8006	8667	9337	10061	10784
	440	7760	8603	9446	10344	11268	12199	13242
	480	9005	10081	11253	12436	13747	15088	16463
	520	10418	11897	13431	15143	16882	18653	20426
	560	12378	14409	16666	19001	21349		
	600	14833	17947	21133				
	660							
	MIL	22405	22196	22043	21781	21547	21274	20941
	V_{MAX}	627.0	613.6	602.7	583.1	565.6	545.5	525.9
12,000 FEET (−9°C)	360	5317	5742	6187	6633	7079	7525	8005
	400	6015	6589	7164	7740	8349	8971	9593
	440	6925	7660	8402	9196	9991	10843	11740
	480	7964	8924	9945	10991	12149	13319	14548
	520	9222	10537	11923	13411	14981	16574	18182
	560	10990	12818	14824	16961	19112		
	600	13587	16510	19524				
	660							
	MIL	20355	20162	20000	19766	19576	19361	19086
	V_{MAX}	625.4	612.4	601.6	582.4	566.9	549.7	530.1
16,000 FEET (−16°C)	360	4854	5240	5626	6012	6398	6811	7226
	400	5443	5945	6446	6964	7502	8041	8594
	440	6196	6839	7511	8201	8900	9655	10410
	480	7058	7920	8808	9749	10724	11764	12838
	520	8178	9328	10559	11850	13261	14703	16163
	560	9796	11431	13238	15178	17147		
	600	12785	15602					
	660							
	MIL	18495	18288	18089	17854	17691	17491	17220
	V_{MAX}	623.7	610.2	597.1	579.4	566.6	551.8	532.4

	ACTUAL OAT DEG. C	TEMP. EFFECTS–FACTORS		
		CRUISE	MIL	$V_{MAX.}$
SEA LEVEL (15°C)	-40	.899	1.062	.914
	-20	.937	1.040	.945
	0	.974	1.017	.977
	20	1.009	.995	1.008
	40	1.042	.832	1.021
4000 FEET (7°C)	-40	.912	1.156	.933
	-20	.951	1.087	.962
	0	.987	1.019	.991
	20	1.022	.915	1.011
	40	1.057	.774	1.024
8000 FEET (−1°C)	-40	.925	1.262	.946
	-20	.964	1.124	.974
	0	1.002	.985	1.002
	20	1.037	.849	1.018
	40	1.072	.711	1.037
12,000 FEET (−9°C)	-40	.938	1.271	.967
	-20	.979	1.100	.984
	0	1.017	.931	1.011
	20	1.054	.786	1.028
	40	1.088	.642	1.044
16,000 FEET (−16°C)	-40	.953	1.175	.967
	-20	.992	1.024	.995
	0	1.031	.868	1.018
	20	1.067	.717	1.040
	40	1.105	.565	1.063

15A–1–(195)D

Figure A5-18.

LOW ALTITUDE CRUISE

GROSS WEIGHT - 50,000 POUNDS

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINES: (2) F100–PW–100

DATE: 24 JAN 1984
DATA BASIS: FLIGHT TEST

	KTAS	DRAG INDEX	TOTAL FUEL FLOW–LB/HR					
		0	20	40	60	80	100	120
SEA LEVEL (15°C)	360	7381	8021	8661	9319	10000	10681	11362
	400	8454	9263	10116	10984	11852	12747	13730
	440	9886	10975	12077	13184	14443	15702	16979
	480	11539	12929	14399	15999	17615	19317	21019
	520	13325	15179	17210	19318	21483	23650	
	560	15625	18266	21003	23788			
	600	18935	22576	26269				
	660							
	MIL	26885	26556	26313	25860	25425	24988	24666
	V_{MAX}	633.9	616.3	603.3	579.8	557.1	532.4	511.8
4000 FEET (7°C)	360	6674	7233	7793	8384	8976	9568	10160
	400	7604	8323	9079	9836	10593	11415	12258
	440	8808	9771	10734	11742	12821	13900	15047
	480	10236	11459	12783	14159	15602	17113	18633
	520	11806	13468	15213	17109	19034	20987	
	560	13958	16261	18743	21274	23828		
	600	16546	19874	23290				
	660							
	MIL	24649	24395	24205	23867	23540	23143	22808
	V_{MAX}	630.2	615.2	603.4	582.4	562.7	539.4	519.9
8000 FEET (−1°C)	360	6051	6536	7040	7551	8062	8573	9107
	400	6840	7484	8141	8798	9476	10194	10913
	440	7870	8709	9547	10451	11370	12309	13347
	480	9071	10142	11315	12493	13806	15141	16512
	520	10464	11942	13476	15182	16916	18680	20446
	560	12398	14425	16675	19002	21344		
	600	14871	17978	21155				
	660							
	MIL	22406	22196	22043	21780	21547	21274	20939
	V_{MAX}	627.1	613.6	602.6	583.1	565.6	545.5	525.8
12,000 FEET (−9°C)	360	5522	5954	6396	6838	7279	7735	8213
	400	6188	6760	7331	7903	8520	9138	9755
	440	7058	7789	8536	9326	10116	10979	11871
	480	8046	9007	10023	11074	12227	13395	14618
	520	9281	10590	11977	13459	15026	16612	18214
	560	11057	12889	14892	17021	19165		
	600	13654	16574	19579				
	660							
	MIL	20354	20160	19998	19761	19572	19355	19080
	V_{MAX}	625.3	612.3	601.4	582.0	566.6	549.2	529.8
16,000 FEET (−16°C)	360	5108	5491	5874	6257	6657	7068	7480
	400	5629	6127	6624	7150	7684	8218	8783
	440	6337	6975	7653	8338	9045	9795	10545
	480	7182	8047	8931	9878	10848	11894	12962
	520	8249	9393	10624	11916	13321	14758	16211
	560	9863	11498	13306	15240	17201		
	600	12863	15669					
	660							
	MIL	18493	18285	18083	17850	17688	17483	17213
	V_{MAX}	623.6	610.0	596.7	579.1	566.3	551.2	531.9

ACTUAL OAT DEG. C	TEMP. EFFECTS–FACTORS		
	CRUISE	MIL	$V_{MAX.}$
−40	.899	1.062	.914
−20	.937	1.040	.945
0	.974	1.017	.977
20	1.009	.995	1.008
40	1.042	.832	1.021

−40	.912	1.156	.933
−20	.951	1.087	.962
0	.987	1.019	.991
20	1.022	.915	1.011
40	1.057	.774	1.024

−40	.925	1.262	.946
−20	.964	1.124	.974
0	1.002	.985	1.002
20	1.037	.849	1.018
40	1.072	.711	1.037

−40	.939	1.271	.967
−20	.979	1.100	.984
0	1.017	.931	1.011
20	1.054	.786	1.028
40	1.088	.642	1.044

−40	.953	1.175	.967
−20	.992	1.024	.995
0	1.031	.868	1.018
20	1.067	.717	1.040
40	1.105	.565	1.063

15A–1–(194)C

Figure A5-19

LOW ALTITUDE CRUISE

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

GROSS WEIGHT - 55,000 POUNDS

REMARKS
ENGINES: (2) F100–PW–100

DATE: 24 JAN 1984
DATA BASIS: FLIGHT TEST

	KTAS	DRAG INDEX 0	TOTAL FUEL FLOW–LB/HR 20	40	60	80	100	120
SEA LEVEL (15° C)	360	7536	8172	8809	9471	10148	10826	11502
	400	8582	9386	10244	11108	11972	12878	13856
	440	9958	11047	12145	13257	14510	15764	17040
	480	11586	12971	14442	16037	17649	19346	21042
	520	13373	15228	17253	19358	21516	23677	
	560	15664	18299	21031	23809			
	600	18935	22569	26253				
	660							
	MIL	26889	26558	26314	25860	25422	24985	24663
	V_{MAX}	634.1	616.4	603.4	579.8	556.9	532.2	511.6
4,000 FEET (7°C)	360	6851	7406	7972	8560	9147	9735	10322
	400	7740	8463	9216	9968	10721	11553	12391
	440	8906	9865	10824	11838	12912	13986	15136
	480	10297	11514	12840	14212	15654	17159	18674
	520	11852	13516	15255	17149	19068	21015	
	560	13988	16284	18762	21286	23834		
	600	16565	19886	23294				
	660							
	MIL	24651	24395	24205	23866	23540	23140	22804
	V_{MAX}	630.3	615.2	603.4	582.4	562.6	539.2	519.7
8,000 FEET (–1°C)	360	6245	6729	7236	7743	8251	8768	9304
	400	7000	7650	8303	8956	9644	10358	11072
	440	8005	8839	9673	10584	11499	12448	13481
	480	9146	10215	11388	12561	13877	15206	16574
	520	10512	11989	13524	15223	16952	18710	20469
	560	12458	14486	16729	19051	21385		
	600	14909	18009	21177				
	660							
	MIL	22406	22196	22042	21778	21544	21268	20935
	V_{MAX}	627.1	613.6	602.6	582.9	565.4	546.1	525.5
12,000 FEET (–9°C)	360	5755	6193	6630	7068	7506	7976	8449
	400	6371	6939	7506	8087	8700	9313	9928
	440	7192	7918	8672	9457	10242	11116	12002
	480	8172	9138	10149	11212	12358	13529	14746
	520	9357	10661	12051	13527	15091	16671	18266
	560	11125	12959	14960	17082	19218		
	600	13727	16643	19640				
	660							
	MIL	20352	20158	19996	19757	19568	19348	19072
	V_{MAX}	625.2	612.1	601.2	581.6	566.3	548.7	528.3
16,000 FEET (–16°C)	360	5393	5775	6158	6551	6962	7374	7785
	400	5854	6348	6849	7379	7908	8439	9017
	440	6502	7140	7820	8501	9218	9963	10712
	480	7315	8184	9063	10017	10982	12036	13098
	520	8368	9507	10744	12043	13441	14876	16323
	560	9931	11567	13376	15303	17257		
	600	12942	15737					
	660							
	MIL	18491	18282	18077	17846	17684	17472	17199
	V_{MAX}	623.5	609.8	596.3	578.8	566.0	550.5	530.9

ACTUAL OAT DEG. C	TEMP. EFFECTS–FACTORS CRUISE	MIL	$V_{MAX.}$
–40	.898	1.062	.914
–20	.937	1.040	.945
0	.974	1.017	.977
20	1.009	.995	1.008
40	1.042	.832	1.021

–40	.912	1.156	.933
–20	.951	1.087	.962
0	.987	1.019	.991
20	1.022	.915	1.011
40	1.057	.774	1.024

–40	.925	1.262	.946
–20	.964	1.124	.974
0	1.002	.985	1.002
20	1.037	.849	1.018
40	1.072	.711	1.037

–40	.939	1.271	.967
–20	.979	1.100	.984
0	1.017	.931	1.011
20	1.054	.786	1.028
40	1.088	.642	1.044

–40	.953	1.175	.967
–20	.992	1.024	.995
0	1.031	.868	1.018
20	1.067	.717	1.040
40	1.105	.565	1.063

15A–1–(193)D

Figure A5-20.

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

LOW ALTITUDE CRUISE

GROSS WEIGHT - 60,000 POUNDS

REMARKS
ENGINES: (2) F100–PW–100

DATE: 24 JAN 1984
DATA BASIS: FLIGHT TEST

	KTAS	DRAG INDEX	TOTAL FUEL FLOW–LB/HR					
		0	20	40	60	80	100	120
SEA LEVEL (15°C)	360	7720	8352	8984	9654	10327	11000	11672
	400	8716	9520	10379	11239	12098	13017	13990
	440	10032	11122	12216	13332	14581	15828	17104
	480	11637	13017	14490	16080	17689	19379	21070
	520	13420	15277	17296	19397	21550	23705	
	560	15703	18332	21058	23830			
	600	18953	22580	26256				
	660							
	MIL	26892	26559	26315	25859	25419	24981	24659
	V_{MAX}	634.2	616.5	603.4	579.7	556.7	532.0	511.4
4000 FEET (7°C)	360	7028	7579	8150	8734	9317	9901	10500
	400	7890	8619	9367	10116	10875	11708	12541
	440	9043	9997	10952	11976	13045	14114	15271
	480	10373	11586	12916	14282	15725	17225	18736
	520	11899	13562	15296	17188	19102	21042	
	560	14035	16325	18799	21316	23857		
	600	16583	19898	23298				
	660							
	MIL	24653	24396	24205	23865	23537	23136	22800
	V_{MAX}	630.4	615.3	603.4	582.3	562.5	539.0	519.4
8000 FEET (–1°C)	360	6473	6965	7468	7971	8474	8990	9539
	400	7182	7830	8479	9127	9827	10537	11246
	440	8141	8971	9809	10719	11629	12590	13617
	480	9265	10341	11508	12679	14002	15325	16691
	520	10585	12066	13604	15297	17022	18773	20527
	560	12525	14555	16791	19108	21435		
	600	14962	18056	21214				
	660							
	MIL	22405	22194	22040	21774	21541	21259	20926
	V_{MAX}	627.0	613.5	602.5	582.6	565.2	544.6	525.0
12,000 FEET (–9°C)	360	6036	6474	6911	7348	7805	8278	8750
	400	6581	7144	7707	8301	8909	9518	10154
	440	7354	8076	8838	9618	10406	11288	12169
	480	8302	9274	10280	11354	12495	13689	14880
	520	9456	10755	12161	13621	15186	16760	18348
	560	11201	13039	15039	17153	19282		
	600	13802	16715	19703				
	660							
	MIL	20351	20155	19994	19751	19564	19339	19060
	V_{MAX}	625.1	612.0	601.0	581.2	566.0	548.0	528.5
16,000 FEET (–16°C)	360	5690	6073	6459	6871	7282	7694	8107
	400	6101	6590	7104	7630	8155	8704	9277
	440	6708	7356	8032	8708	9439	10179	10943
	480	7464	8337	9215	10174	11141	12197	13257
	520	8501	9634	10877	12185	13577	15008	16450
	560	10017	11656	13470	15391	17337		
	600	13063	15849					
	660							
	MIL	18484	18276	18066	17839	17679	17457	17182
	V_{MAX}	623.0	609.4	595.0	578.3	565.6	549.4	528.7

	ACTUAL OAT DEG. C	TEMP EFFECTS – FACTORS		
		CRUISE	MIL	$V_{MAX.}$
SEA LEVEL (15°C)	–40	.899	1.062	.914
	–20	.937	1.040	.945
	0	.974	1.017	.977
	20	1.009	.995	1.008
	40	1.042	.832	1.021
4000 FEET (7°C)	–40	.912	1.156	.933
	–20	.951	1.087	.962
	0	.987	1.019	.991
	20	1.022	.915	1.011
	40	1.057	.774	1.024
8000 FEET (–1°C)	–40	.925	1.262	.946
	–20	.964	1.124	.974
	0	1.002	.985	1.002
	20	1.037	.849	1.018
	40	1.072	.711	1.037
12,000 FEET (–9°C)	–40	.939	1.271	.967
	–20	.979	1.100	.984
	0	1.017	.931	1.011
	20	1.054	.786	1.028
	40	1.088	.642	1.044
16,000 FEET (–16°C)	–40	.953	1.175	.967
	–20	.992	1.024	.995
	0	1.031	.868	1.018
	20	1.067	.717	1.040
	40	1.105	.565	1.063

15A–1–(221)A

Figure A5-21

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

LOW ALTITUDE CRUISE

GROSS WEIGHT - 65,000 POUNDS

REMARKS
ENGINES: (2) F100–PW–100

DATE: 24 JAN 1984
DATA BASIS: FLIGHT TEST

	KTAS	DRAG INDEX 0	TOTAL FUEL FLOW–LB/HR					
			20	40	60	80	100	120
SEA LEVEL (15°C)	360	7889	8518	9154	9822	10491	11159	11828
	400	8857	9667	10522	11377	12233	13164	14132
	440	10167	11256	12345	13475	14719	15962	17239
	480	11715	13090	14569	16153	17761	19446	21131
	520	13467	15326	17339	19437	21584	23732	
	560	15743	18366	21088	23852			
	600	18974	22594	26262				
	660							
	MIL	26894	26560	26315	25858	25416	24978	24655
	V_{MAX}	634.4	616.5	603.4	579.6	556.6	531.8	511.1
4000 FEET (7°C)	360	7251	7800	8379	8958	9538	10117	10735
	400	8069	8806	9550	10294	11068	11897	12725
	440	9181	10131	11082	12117	13181	14245	15408
	480	10470	11678	13014	14375	15822	17316	18822
	520	11965	13631	15360	17252	19160	21095	
	560	14096	16379	18852	21363	23897		
	600	16601	19910	23302				
	660							
	MIL	24653	24396	24205	23863	23533	23129	22791
	V_{MAX}	630.4	615.3	603.4	582.2	562.3	538.6	518.9
8000 FEET (−1°C)	360	6726	7227	7728	8229	8729	9266	9812
	400	7368	8012	8656	9307	10012	10717	11422
	440	8293	9118	9966	10871	11776	12751	13772
	480	9394	10477	11640	12822	14140	15457	16822
	520	10659	12142	13684	15371	17092	18837	20584
	560	12598	14630	16859	19172	21491		
	600	15045	18134	21282				
	660							
	MIL	22402	22192	22038	21768	21536	21249	20817
	V_{MAX}	626.8	613.3	602.3	582.1	564.8	544.0	524.5
12,000 FEET (−9°C)	360	6323	6760	7198	7642	8115	8588	9060
	400	6819	7377	7939	8543	9147	9751	10412
	440	7541	8259	9031	9807	10614	11490	12366
	480	8436	9414	10415	11502	12638	13814	15019
	520	9588	10881	12288	13756	15318	16888	18470
	560	11279	13122	15120	17227	19349		
	600	13887	16798	19777				
	660							
	MIL	20347	20152	19991	19746	19559	19327	19043
	V_{MAX}	624.9	611.7	600.8	580.7	565.6	547.0	527.5
16,000 FEET (−16°C)	360	6044	6428	6839	7251	7662	8074	8520
	400	6381	6881	7407	7933	8463	9037	9611
	440	6926	7586	8257	8941	9676	10411	11191
	480	7639	8508	9397	10350	11329	12379	13441
	520	8647	9787	11026	12345	13730	15159	16596
	560	10176	11826	13656	15572	17512		
	600	13202	15978					
	660							
	MIL	18476	18268	18051	17827	17668	17429	17158
	V_{MAX}	622.5	608.9	594.6	577.4	564.8	547.4	528.1

	ACTUAL OAT DEG. C	TEMP. EFFECTS–FACTORS		
		CRUISE	MIL	$V_{MAX.}$
SEA LEVEL (15°C)	-40	.899	1.062	.914
	-20	.937	1.040	.945
	0	.974	1.017	.977
	20	1.009	.995	1.008
	40	1.042	.832	1.021
4000 FEET (7°C)	-40	.912	1.156	.933
	-20	.951	1.087	.962
	0	.987	1.019	.991
	20	1.022	.915	1.011
	40	1.057	.774	1.024
8000 FEET (−1°C)	-40	.925	1.262	.946
	-20	.964	1.124	.974
	0	1.002	.985	1.002
	20	1.037	.849	1.018
	40	1.072	.711	1.037
12,000 FEET (−9°C)	-40	.939	1.271	.967
	-20	.979	1.100	.984
	0	1.017	.931	1.011
	20	1.054	.786	1.028
	40	1.088	.642	1.044
16,000 FEET (−16°C)	-40	.953	1.175	.967
	-20	.992	1.024	.995
	0	1.031	.868	1.018
	20	1.067	.717	1.040
	40	1.105	.565	1.063

15A-1-(228)

Figure A5-21A.

LOW ALTITUDE CRUISE

GROSS WEIGHT - 70,000 POUNDS

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINES: (2) F100–PW–100

DATE: 24 JAN 1984
DATA BASIS: FLIGHT TEST

	KTAS	DRAG INDEX 0	TOTAL FUEL FLOW–LB/HR 20	40	60	80	100	120
SEA LEVEL (15°C)	360	8096	8720	9365	10029	10694	11358	12022
	400	9032	9851	10702	11553	12404	13353	14316
	440	10306	11390	12475	13618	14857	16095	17375
	480	11792	13163	14647	16226	17833	19513	21192
	520	13516	15378	17385	19480	21620	23763	
	560	15800	18416	21134	23892			
	600	18995	22607	26268				
	660							
	MIL	26895	26561	26315	25855	25410	24973	24649
	V_{MAX}	634.4	616.6	603.4	579.5	556.2	531.6	510.7
4000 FEET (7°C)	360	7489	8047	8622	9197	9772	10348	10986
	400	8246	8986	9726	10466	11255	12079	12903
	440	9321	10267	11213	12259	13318	14389	15548
	480	10602	11806	13153	14509	15963	17450	18954
	520	12042	13714	15436	17330	19234	21162	
	560	14157	16434	18904	21410	23936		
	600	16669	19976	23361				
	660							
	MIL	24651	24394	24203	23856	23529	23120	22779
	V_{MAX}	630.3	615.1	603.2	581.8	562.0	538.1	518.1
8000 FEET (-1°C)	360	7015	7516	8016	8517	9034	9581	10127
	400	7600	8240	8880	9547	10248	10949	11652
	440	8461	9282	10141	11042	11942	12933	13949
	480	9529	10621	11779	12974	14285	15602	16961
	520	10782	12265	13817	15498	17216	18955	20696
	560	12683	14719	16941	19249	21561		
	600	15127	18211	21349				
	660							
	MIL	22400	22189	22035	21761	21530	21233	20900
	V_{MAX}	626.7	613.2	602.1	581.6	564.4	543.1	523.5
12,000 FEET (-9°C)	360	6638	7075	7512	7982	8455	8928	9400
	400	7077	7633	8213	8814	9415	10031	10707
	440	7750	8475	9247	10018	10847	11718	12588
	480	8596	9582	10578	11681	12811	13892	15191
	520	9729	11016	12345	13906	15461	17026	18601
	560	11385	13235	15235	17335	19449		
	600	14031	16944	19916				
	660							
	MIL	20340	20145	19985	19736	19552	19311	19022
	V_{MAX}	624.4	611.3	600.3	579.9	565.0	545.8	526.2
16,000 FEET (-16°C)	360	6432	6844	7255	7667	8079	8525	8973
	400	6674	7197	7724	8251	8811	9386	9962
	440	7171	7838	8504	9207	9936	10666	11465
	480	7862	8726	9631	10579	11574	12618	13685
	520	8812	9962	11196	12528	13911	15334	16766
	560	10347	12004	13851	15764	17696		
	600	13372	16141					
	660							
	MIL	18466	18259	18033	17814	17656	17398	17131
	V_{MAX}	621.8	608.2	593.4	576.3	563.8	545.2	526.2

ACTUAL OAT DEG. C	TEMP. EFFECTS–FACTORS CRUISE	MIL	$V_{MAX.}$
-40	.899	1.062	.914
-20	.937	1.040	.945
0	.974	1.017	.977
20	1.009	.995	1.008
40	1.042	.832	1.021

-40	.912	1.156	.933
-20	.951	1.087	.962
0	.987	1.019	.991
20	1.022	.915	1.011
40	1.057	.774	1.024

-40	.925	1.262	.946
-20	.964	1.124	.974
0	1.002	.985	1.002
20	1.037	.849	1.018
40	1.072	.711	1.037

-40	.939	1.271	.967
-20	.979	1.100	.984
0	1.017	.931	1.011
20	1.054	.786	1.028
40	1.088	.642	1.044

-40	.953	1.175	.967
-20	.992	1.024	.995
0	1.031	.868	1.018
20	1.067	.717	1.040
40	1.105	.565	1.063

15A-1-(229)

Figure A5-21B.

HIGH ALTITUDE CRUISE

GROSS WEIGHT - 30,000 POUNDS

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINES: (2) F100–PW–100

DATE: 24 JAN 1984
DATA BASIS: FLIGHT TEST

	KTAS	DRAG INDEX 0	TOTAL FUEL FLOW–LB/HR					
			20	40	60	80	100	120
20,000 FEET (–24.6° C)	360	3859	4184	4528	4872	5216	5569	5937
	400	4446	4893	5340	5792	6268	6745	7227
	440	5167	5741	6334	6945	7563	8210	8857
	480	5998	6762	7545	8364	9196	10136	11093
	520	7057	8069	9144	10309	11582	12816	14261
	560	8394	9847	11556	13363	15199		
	600	12042	14788					
	660							
	MIL	16663	16413	16164	15944	15796	15594	15326
	V_{MAX}	622.2	607.3	591.4	576.2	564.8	549.9	532.6
25,000 FEET (–34.5°C)	360	3376	3658	3939	4220	4511	4814	5117
	400	3856	4225	4594	4986	5379	5774	6192
	440	4430	4912	5418	5925	6464	7010	7591
	480	5083	5730	6389	7096	7834	8611	9433
	520	6023	6903	7841	8868	9961	11107	12289
	560	7137	8481	9973	11565	13222		
	600	11804						
	660							
	MIL	14567	14282	14029	13831	13661	13367	13101
	V_{MAX}	617.0	599.9	584.0	571.7	561.7	544.6	529.8
30,000 FEET (–44.4° C)	360	3030	3259	3487	3733	3980	4227	4478
	400	3374	3675	3995	4316	4640	4984	5328
	440	3804	4214	4630	5070	5527	5999	6488
	480	4350	4887	5473	6076	6703	7362	8063
	520	5146	5927	6744	7597	8555	9572	10622
	560	6371	7595	8979	10485			
	600	11619						
	660							
	MIL	12387	12115	11907	11733	11498	11149	10889
	V_{MAX}	607.2	589.8	577.1	566.4	553.9	537.5	525.3

ACTUAL OAT DEG. C	TEMP. EFFECTS–FACTORS		
	CRUISE	MIL	$V_{MAX.}$
–80	.882	1.175	.921
–60	.926	1.142	.949
–40	.969	1.075	.976
–20	1.009	.961	1.005
–0	1.048	.800	1.028

–80	.900	1.157	.949
–60	.945	1.109	.971
–40	.988	1.015	.991
–20	1.030	.881	1.015
–0	1.070	.723	1.036

–80	.919	1.280	.973
–60	.966	1.120	.989
–40	1.010	.961	1.004
–20	1.052	.800	1.019
–0	1.043	.639	1.034

15A–1–(192–1)D

Figure A5-22. (Sheet 1 of 2)

HIGH ALTITUDE CRUISE

GROSS WEIGHT - 30,000 POUNDS

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINES: (2) F100–PW–100

DATE: 24 JAN 1984
DATA BASIS: FLIGHT TEST

	KTAS	DRAG INDEX 0	TOTAL FUEL FLOW–LB/HR 20	40	60	80	100	120
36,000 FEET (−54.3°C)	360	2773	2976	3177	3379	3592	3811	4030
	400	2998	3256	3515	3789	4072	4356	4656
	440	3312	3652	4014	4390	4778	5174	5581
	480	3738	4207	4711	5222	5757	6345	6957
	520	4448	5132	5838	6632	7474	8351	
	560	5930	7140	8485				
	600							
	660							
	MIL	10079	9761	9511	9236	8950	8741	8488
	V_{MAX}	594.3	579.5	586.9	552.5	537.4	626.2	512.5

ACTUAL OAT DEG. C	TEMP. EFFECTS–FACTORS CRUISE	MIL	$V_{MAX.}$
−80	.940	1.176	.932
−60	.987	1.038	.997
−40	1.032	.901	1.012
−20	1.075	.763	1.028
−0	1.117	.625	1.044

	KTAS	DRAG INDEX 0	TOTAL FUEL FLOW–LB/HR 20	40	60	80	100	120
40,000 FEET (−56.4° C)	360	2715	2888	3065	3242	3424	3612	3801
	400	2785	3005	3234	3463	3706	3948	4199
	440	2957	3246	3540	3848	4160	4493	4834
	480	3251	3645	4044	4461	4914	5389	5876
	520	3843	4397	5003	5656	6341		
	560	5153	6173	7272				
	600							
	660							
	MIL	7897	7628	7422	7121	6915	6726	6402
	V_{MAX}	587.9	573.5	561.1	542.6	529.0	516.4	493.8

ACTUAL OAT DEG. C	TEMP. EFFECTS–FACTORS CRUISE	MIL	$V_{MAX.}$
−80	.944	1.142	.978
−60	.992	1.019	.998
−40	1.037	.898	1.017
−20	1.081	.777	1.036
−0	1.122	.656	1.066

	KTAS	DRAG INDEX 0	TOTAL FUEL FLOW–LB/HR 20	40	60	80	100	120
45,000 FEET (−56.4° C)	360	3276	3438	3599	3761	3925	4089	4252
	400	2828	3025	3223	3428	3636	3850	4070
	440	2849	3102	3358	3626	3896	4188	
	480	2992	3310	3644	4005	4383	4767	
	520	3466	3932	4438	4966			
	560	4534	5357					
	600							
	660							
	MIL	6091	5926	5700	5482	5297	4972	4169
	V_{MAX}	579.5	566.4	549.0	531.1	515.7	487.6	401.3

ACTUAL OAT DEG. C	TEMP. EFFECTS–FACTORS CRUISE	MIL	$V_{MAX.}$
−80	.944	1.154	.972
−60	.992	1.019	.995
−40	1.037	.880	1.018
−20	1.081	.745	1.042
−0	1.122	.610	1.065

15A–1–(192–2)D

Figure A5-22. (Sheet 2)

HIGH ALTITUDE CRUISE

GROSS WEIGHT - 35,000 POUNDS

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINES: (2) F100–PW–100

DATE: 24 JAN 1984
DATA BASIS: FLIGHT TEST

	KTAS	DRAG INDEX 0	TOTAL FUEL FLOW–LB/HR					
			20	40	60	80	100	120
20,000 FEET (–24.6° C)	360	4024	4357	4697	5037	5377	5737	6101
	400	4582	5025	5468	5924	6396	6868	7353
	440	5276	5845	6441	7047	7665	8308	8950
	480	6062	6826	7604	8421	9247	10189	11143
	520	7105	8111	9184	10349	11615	12943	14281
	560	8417	9864	11569	13360	15195		
	600	12061	14789					
	660							
	MIL	16667	16414	16165	15945	15797	15594	15324
	V_{MAX}	622.4	607.4	591.5	576.2	564.8	549.9	532.5
25,000 FEET (–34.5°C)	360	3607	3885	4162	4445	4743	5042	5340
	400	4031	4396	4770	5159	5548	5949	6363
	440	4559	5043	5545	6051	6591	7132	7720
	480	5187	5830	6494	7195	7937	8708	9532
	520	6091	6971	7902	8930	10021	11162	12336
	560	7209	8554	10043	11629	13279		
	600	11822						
	660							
	MIL	14566	14282	14027	13827	13656	13357	13092
	V_{MAX}	616.9	599.9	583.9	571.5	561.5	544.1	529.4
30,000 FEET (–44.4° C)	360	3304	3536	3783	4031	4278	4531	4789
	400	3589	3899	4216	4532	4867	5207	5547
	440	3977	4387	4799	5260	5702	6181	6665
	480	4483	5014	5610	6213	6834	7502	8197
	520	5248	6033	6848	7709	8659	9676	10721
	560	6503	7736	9119	10627			
	600	11685						
	660							
	MIL	12377	12107	11897	11721	11483	11122	10869
	V_{MAX}	606.5	589.3	576.4	565.7	562.2	536.3	524.4

	ACTUAL OAT DEG. C	TEMP. EFFECTS–FACTORS		
		CRUISE	MIL	$V_{MAX.}$
20,000 FEET (–24.6° C)	–80	.882	1.175	.921
	–60	.926	1.142	.949
	–40	.969	1.075	.976
	–20	1.009	.961	1.005
	–0	1.048	.800	1.028
25,000 FEET (–34.5°C)	–80	.900	1.157	.949
	–60	.945	1.109	.971
	–40	.988	1.015	.991
	–20	1.030	.881	1.015
	–0	1.070	.723	1.036
30,000 FEET (–44.4° C)	–80	.919	1.280	.973
	–60	.966	1.120	.989
	–40	1.010	.961	1.004
	–20	1.052	.800	1.019
	–0	1.043	.639	1.034

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Figure A5-23. (Sheet 1 of 2)

HIGH ALTITUDE CRUISE

GROSS WEIGHT - 35,000 POUNDS

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINES: (2) F100-PW-100

DATE: 24 JAN 1984
DATA BASIS: FLIGHT TEST

	KTAS	DRAG INDEX 0	TOTAL FUEL FLOW–LB/HR					
			20	40	60	80	100	120
35,000 FEET (–54.3°C)	360	3139	3342	3552	3772	3992	4213	4449
	400	3281	3542	3819	4105	4391	4694	4997
	440	3535	3879	4251	4626	5016	5412	5842
	480	3920	4409	4908	5416	5972	6557	7170
	520	4654	5338	6058	6853	7899	8579	
	560	6100	7312	8651				
	600							
	660							
	MIL	10044	9729	9486	9191	8908	8700	8375
	V_{MAX}	592.7	578.1	565.6	550.1	535.1	524.1	506.3
40,000 FEET (–56.4° C)	360	3385	3574	3763	3952	4154	4358	4561
	400	3189	3420	3663	3909	4159	4426	4693
	440	3281	3580	3895	4212	4557	4904	5269
	480	3522	3913	4308	4749	5208	5688	6171
	520	4119	4680	5305	5970	6660		
	560	5367	6397					
	600							
	660							
	MIL	7838	7584	7365	7052	6848	6551	6262
	V_{MAX}	584.7	570.9	557.6	538.1	524.5	504.2	483.8
45,000 FEET (–56.4° C)	360	4881	5045	5209	5372	5536		
	400	3660	3875	4099	4323	4546		
	440	3324	3596	3872	4166	4465		
	480	3363	3713	4083	4477	4872		
	520	3855	4360	4889				
	560	5071						
	600							
	660							
	MIL	5996	5808	5529	5350	4918		
	V_{MAX}	571.7	557.3	535.1	520.1	482.6		

	ACTUAL OAT DEG. C	TEMP. EFFECTS–FACTORS		
		CRUISE	MIL	$V_{MAX.}$
35,000 FEET (–54.3°C)	–80	.940	1.176	.932
	–60	.987	1.038	.997
	–40	1.032	.901	1.012
	–20	1.075	.763	1.028
	–0	1.117	.625	1.044
40,000 FEET (–56.4° C)	–80	.944	1.142	.978
	–60	.992	1.019	.998
	–40	1.037	.898	1.017
	–20	1.081	.777	1.036
	–0	1.122	.656	1.056
45,000 FEET (–56.4° C)	–80	.944	1.154	.972
	–60	.992	1.019	.995
	–40	1.037	.880	1.018
	–20	1.081	.745	1.042
	–0	1.122	.610	1.065

15A–1–(191–2)D

Figure A5-23. (Sheet 2)

HIGH ALTITUDE CRUISE

GROSS WEIGHT - 40,000 POUNDS

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINES: (2) F100–PW–100

DATE: 24 JAN 1984
DATA BASIS: FLIGHT TEST

	KTAS	DRAG INDEX 0	TOTAL FUEL FLOW–LB/HR 20	40	60	80	100	120
20,000 FEET (−24.6° C)	360	4243	4579	4915	5250	5597	5957	6316
	400	4756	5195	5633	6096	6564	7031	7521
	440	5406	5971	6570	7172	7793	8430	9082
	480	6156	6920	7694	8511	9339	10280	11234
	520	7162	8164	9234	10401	11662	12983	14315
	560	8484	9929	11639	13433	15252		
	600	12086	14796					
	660							
	MIL	16667	16415	16164	15943	15794	15586	15319
	V_{MAX}	622.4	607.4	591.4	576.1	564.7	549.4	532.2
25,000 FEET (−34.5°C)	360	3879	4156	4437	4735	5033	5330	5634
	400	4238	4599	4983	5367	5753	6161	6570
	440	4714	5202	5700	6212	6748	7290	7882
	480	5319	5957	6627	7323	8071	8836	9665
	520	6181	7063	7994	9019	10111	11248	12415
	560	7312	8661	10150	11732	13376		
	600	11867						
	660							
	MIL	14562	14278	14021	13820	13647	13340	13078
	V_{MAX}	616.6	599.7	583.6	571.0	561.0	543.1	528.6
30,000 FEET (−44.4° C)	360	3639	3887	4134	4382	4640	4898	5156
	400	3855	4171	4487	4819	5157	5496	5864
	440	4194	4600	5028	5474	5932	6410	6895
	480	4649	5196	5785	6391	7006	7688	8388
	520	5382	6175	6988	7862	8815	9824	
	560	6689	7936	9323	10838			
	600	11814						
	660							
	MIL	12356	12090	11878	11702	11411	11084	10840
	V_{MAX}	605.2	588.2	575.3	564.5	549.8	534.5	523.0

ACTUAL OAT DEG. C	TEMP. EFFECTS–FACTORS CRUISE	MIL	$V_{MAX.}$
−80	.882	1,175	.921
−60	.926	1.142	.949
−40	.969	1.075	.976
−20	1.009	.961	1.005
−0	1.048	.800	1.028

−80	.900	1.157	.949
−60	.945	1.109	.971
−40	.988	1.015	.991
−20	1.030	.881	1.015
−0	1.070	.723	1.036

−80	.919	1.280	.973
−60	.966	1.120	.989
−40	1.010	.961	1.004
−20	1.052	.800	1.019
−0	1.043	.639	1.034

15A-1-(190-1)D

Figure A5-24. (Sheet 1 of 2)

HIGH ALTITUDE CRUISE

GROSS WEIGHT - 40,000 POUNDS

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINES: (2) F100–PW–100

DATE: 24 JAN 1984
DATA BASIS: FLIGHT TEST

	KTAS	DRAG INDEX 0	TOTAL FUEL FLOW–LB/HR					
			20	40	60	80	100	120
35,000 FEET (–54.3°C)	360	3614	3835	4056	4281	4518	4755	4991
	400	3616	3904	4192	4486	4792	5098	5423
	440	3799	4171	4543	4934	5326	5753	6184
	480	4146	4638	5137	5645	6221	6812	7418
	520	4900	5587	6332	7138	7983		
	560	6335	7557	8899				
	600							
	660							
	MIL	9994	9684	9448	9124	8849	8647	8237
	V_{MAX}	590.4	576.0	563.6	546.6	532.0	521.3	498.6
40,000 FEET (–56.4° C)	360	4603	4809	5015	5221	5427	5633	5839
	400	3740	3989	4249	4519	4789	5068	5347
	440	3677	3999	4329	4682	5040	5414	
	480	3844	4248	4689	5155	5644	6137	
	520	4444	5041	5680	6349			
	560	5769	6804					
	600							
	660							
	MIL	7747	7510	7219	6947	6713	6298	5555
	V_{MAX}	579.9	566.4	548.8	531.1	515.5	486.5	423.5
45,000 FEET (–56.4° C)	360	6926	7090	7254				
	400	5036	5262	5488				
	440	4061	4367	4673				
	480	3861	4250	4654				
	520	4362	4905					
	560	5711						
	600							
	660							
	MIL	5866	5553	5307				
	V_{MAX}	561.8	537.1	516.5				

ACTUAL OAT DEG. C	TEMP. EFFECTS–FACTORS		
	CRUISE	MIL	$V_{MAX.}$
–80	.940	1.176	.932
–60	.987	1.038	.997
–40	1.032	.901	1.012
–20	1.075	.763	1.028
–0	1.117	.625	1.044

–80	.944	1.142	.978
–60	.992	1.019	.998
–40	1.037	.898	1.017
–20	1.081	.777	1.036
–0	1.122	.656	1.056

–80	.944	1.154	.972
–60	.992	1.019	.995
–40	1.037	.880	1.018
–20	1.081	.745	1.042
–0	1.122	.610	1.065

15A-1-(190-2)D

Figure A5-24. (Sheet 2)

HIGH ALTITUDE CRUISE

GROSS WEIGHT - 45,000 POUNDS

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINES: (2) F100–PW–100

DATE: 24 JAN 1984
DATA BASIS: FLIGHT TEST

	KTAS	DRAG INDEX 0	TOTAL FUEL FLOW–LB/HR					
			20	40	60	80	100	120
20,000 FEET (–24.6° C)	360	4504	4838	5172	5511	5868	6225	6582
	400	4952	5387	5829	6292	6755	7224	7714
	440	5553	6120	6717	7314	7938	8571	9236
	480	6279	7046	7818	8634	9473	10409	11365
	520	7233	8232	9299	10470	11727	13041	14366
	560	8559	10001	11717	13505	15316		
	600	12164	14857					
	660							
	MIL	16663	16411	16159	15939	15790	15576	15311
	V_{MAX}	622.2	607.2	591.1	575.8	564.4	548.7	531.7
25,000 FEET (–34.5°C)	360	4173	4455	4753	5051	5349	5653	5965
	400	4482	4855	5236	5617	6014	6419	6824
	440	4918	5411	5904	6427	6957	7516	8103
	480	5472	6105	6783	7474	8232	9002	9827
	520	6296	7182	8119	9138	10234	11368	12527
	560	7451	8808	10301	11881	13521		
	600	11954						
	660							
	MIL	14551	14269	14010	13807	13634	13315	13057
	V_{MAX}	616.0	599.1	582.9	570.3	560.2	541.6	527.5
30,000 FEET (–44.4° C)	360	4048	4296	4551	4809	5068	5328	5621
	400	4171	4489	4823	5164	5505	5876	6252
	440	4438	4846	5287	5729	6200	6674	7177
	480	4857	5423	6007	6616	7246	7928	8638
	520	5579	6365	7179	8074	9034	10038	
	560	6901	8166	9560	11084			
	600	12001						
	660							
	MIL	12326	12066	11855	11678	11349	11034	10799
	V_{MAX}	603.2	586.8	573.9	563.1	546.9	532.1	521.0

ACTUAL OAT DEG. C	TEMP. EFFECTS–FACTORS		
	CRUISE	MIL	$V_{MAX.}$
–80	.882	1.175	.921
–60	.926	1.142	.949
–40	.969	1.075	.976
–20	1.009	.961	1.005
–0	1.048	.800	1.028
–80	.900	1.157	.949
–60	.945	1.109	.971
–40	.988	1.015	.991
–20	1.030	.881	1.015
–0	1.070	.723	1.036
–80	.919	1.280	.973
–60	.966	1.120	.989
–40	1.010	.961	1.004
–20	1.052	.800	1.019
–0	1.043	.639	1.034

15A-1-(189-1)D

Figure A5-25. (Sheet 1 of 2)

HIGH ALTITUDE CRUISE

GROSS WEIGHT - 45,000 POUNDS

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINES: (2) F100–PW–100

DATE: 24 JAN 1984
DATA BASIS: FLIGHT TEST

	KTAS	DRAG INDEX	TOTAL FUEL FLOW–LB/HR					
		0	20	40	60	80	100	120
35,000 FEET (−54.3°C)	360	4376	4613	4850	5094	5349	5604	5859
	400	4047	4337	4643	4952	5267	5603	5938
	440	4143	4520	4915	5312	5744	6180	6638
	480	4435	4927	5426	6972	6546	7149	7756
	520	5185	5871	6647	7465	8317		
	560	6514	7747	9079				
	600							
	660							
	MIL	9938	9646	9419	9060	8782	8494	8061
	V_{MAX}	587.8	574.0	562.1	543.2	528.4	512.9	488.8
40,000 FEET (−56.4° C)	360	6263	6469	6675	6881	7087		
	400	4660	4938	5221	5503	5786		
	440	4166	4518	4877	5253	5633		
	480	4222	4668	5144	5643	6146		
	520	4849	5485	6155				
	560	6353						
	600							
	660							
	MIL	7623	7394	7036	6807	6313		
	V_{MAX}	573.2	559.4	537.0	521.8	487.6		
45,000 FEET (−56.4° C)	360	9389						
	400	6896						
	440	5255						
	480	4540						
	520	4976						
	560							
	600							
	660							
	MIL	5560						
	V_{MAX}	537.7						

ACTUAL OAT DEG. C	TEMP. EFFECTS–FACTORS		
	CRUISE	MIL	$V_{MAX.}$
−80	.940	1.176	.932
−60	.987	1.038	.997
−40	1.032	.901	1.012
−20	1.075	.763	1.028
−0	1.117	.625	1.044

−80	.944	1.142	.978
−60	.992	1.019	.998
−40	1.037	.898	1.017
−20	1.081	.777	1.036
−0	1.122	.656	1.056

−80	.944	1.154	.972
−60	.992	1.019	.995
−40	1.037	.880	1.018
−20	1.081	.745	1.042
−0	1.122	.610	1.065

15A-1-(189-2)D

Figure A5-25. (Sheet 2)

HIGH ALTITUDE CRUISE

GROSS WEIGHT - 50,000 POUNDS

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINES: (2) F100-PW-100

DATE: 24 JAN 1984
DATA BASIS: FLIGHT TEST

	KTAS	DRAG INDEX						
		TOTAL FUEL FLOW-LB/HR						
		0	20	40	60	80	100	120
20,000 FEET (−24.6° C)	360	4788	5122	5458	5815	6172	6529	6889
	400	5184	5614	6067	6526	6985	7462	7948
	440	5733	6307	6899	7495	8122	8750	9433
	480	6419	7182	7958	8768	9621	10551	11511
	520	7361	8362	9423	10609	11867	13173	14493
	560	8646	10082	11806	13589	15393		
	600	12248	14924					
	660							
	MIL	16657	16406	16152	15934	15785	15560	15294
	V_{MAX}	621.9	606.9	590.7	575.4	564.0	547.7	530.6
25,000 FEET (−34.5°C)	360	4551	4849	5147	5445	5754	6066	6378
	400	4773	5156	5539	5932	6339	6746	7176
	440	5152	5640	6138	6664	7189	7767	8349
	480	5661	6293	6979	7681	8434	9216	10034
	520	6429	7321	8267	9279	10381	11513	12667
	560	7648	9020	10523	12102			
	600	12060						
	660							
	MIL	14538	14257	13994	13787	13590	13279	13031
	V_{MAX}	615.2	598.3	581.9	569.1	557.6	539.6	526.0
30,000 FEET (−44.4° C)	360	4605	4864	5122	5390	5683	5976	6269
	400	4534	4873	5216	5562	5939	6317	6702
	440	4729	5169	5615	6083	6561	7059	7580
	480	5094	5672	6261	6865	7518	8193	8916
	520	5809	6596	7404	8325	9295	10301	
	560	7095	8376	9780	11307			
	600	12232						
	660							
	MIL	12288	12039	11830	11656	11286	10978	10687
	V_{MAX}	600.8	585.1	572.4	561.7	544.0	529.5	515.7
35,000 FEET (−54.3°C)	360	5631	5887	6145	6404	6662	6921	7179
	400	4602	4914	5229	5567	5906	6251	6601
	440	4540	4941	5343	5784	6226	6693	7161
	480	4760	5266	5799	6380	6985	7600	
	520	5506	6225	7007	7829	8689		
	560	6944	8206					
	600							
	660							
	MIL	9853	9573	9312	8945	8692	8226	7542
	V_{MAX}	583.8	570.1	556.4	537.1	523.6	498.1	456.4
40,000 FEET (−56.4° C)	360	8288	8494	8700	8906	9111		
	400	6021	6306	6591	6875	7160		
	440	4892	5275	5661	6047	6433		
	480	4712	5199	5709	6223			
	520	5341	6024	6732				
	560	6994						
	600							
	660							
	MIL	7488	7129	6848	6270	5881		
	V_{MAX}	565.1	543.2	524.5	484.3	453.7		

ACTUAL OAT DEG. C	TEMP. EFFECTS-FACTORS		
	CRUISE	MIL	$V_{MAX.}$
−80	.882	1.175	.921
−60	.926	1.142	.949
−40	.969	1.075	.976
−20	1.009	.961	1.005
−0	1.048	.800	1.028
−80	.900	1.157	.949
−60	.945	1.109	.971
−40	.988	1.015	.991
−20	1.030	.881	1.015
−0	1.070	.723	1.036
−80	.919	1.280	.973
−60	.966	1.120	.989
−40	1.010	.961	1.004
−20	1.052	.800	1.019
−0	1.043	.639	1.034
−80	.940	1.176	.932
−60	.987	1.038	.997
−40	1.032	.901	1.012
−20	1.075	.763	1.028
−0	1.117	.625	1.044
−80	.944	1.142	.978
−60	.992	1.019	.998
−40	1.037	.898	1.017
−20	1.081	.777	1.036
−0	1.122	.656	1.056

15A-1-(188)D

Figure A5-26

HIGH ALTITUDE CRUISE

GROSS WEIGHT - 55,000 POUNDS

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINES: (2) F100–PW–100

DATE: 24 JAN 1984
DATA BASIS: FLIGHT TEST

	KTAS	DRAG INDEX	TOTAL FUEL FLOW–LB/HR					
		0	20	40	60	80	100	120
20,000 FEET (–24.6° C)	360	5113	5448	5805	6162	6518	6878	7256
	400	5445	5885	6342	6799	7264	7748	8232
	440	5943	6527	7114	7717	8340	8963	9668
	480	6588	7347	8127	8932	9803	10726	11693
	520	7498	8503	9559	10761	12019	13318	14633
	560	8800	10257	11975	13756	15553		
	600	12369	15028					
	660							
	MIL	16647	16399	16140	15924	15775	15552	15271
	V_{MAX}	621.3	606.4	589.9	574.6	563.2	545.9	529.1
25,000 FEET (–34.5°C)	360	4989	5287	5589	5901	6213	6525	6856
	400	5099	5484	5876	6284	6693	7119	7574
	440	5416	5902	6418	6941	7490	8068	8653
	480	5881	6528	7208	7928	8675	9471	10283
	520	6617	7521	8481	9500	10601	11734	12884
	560	7848	9235	10748	12328			
	600	12225						
	660							
	MIL	14516	14236	13973	13765	13540	13234	12993
	V_{MAX}	613.9	597.0	580.6	567.8	554.7	537.2	523.9
30,000 FEET (–44.4° C)	360	5406	5700	5993	6287	6591	6899	7207
	400	4969	5314	5671	6051	6431	6827	7233
	440	5074	5525	5991	6474	6969	7495	8025
	480	5384	5962	6562	7177	7852	8548	9271
	520	6064	6854	7686	8606	9588	10597	
	560	7279	8581	10000	11517			
	600							
	660							
	MIL	12250	12009	11805	11634	11219	10915	10487
	V_{MAX}	598.4	583.3	570.8	560.4	540.8	526.5	506.2
35,000 FEET (–54.3°C)	360	7228	7487	7745	8004	8262	8521	
	400	5445	5786	6130	6484	6837	7191	
	440	5010	5423	5871	6323	6797	7272	
	480	5121	5642	6232	6840	7462		
	520	5863	6636	7452	8301			
	560	7445	8723					
	600							
	660							
	MIL	9751	9487	9139	8811	8453	7393	
	V_{MAX}	579.1	565.6	547.4	530.0	510.6	445.7	
40,000 FEET (–56.4° C)	360	10636	10842	11048				
	400	7752	8036	8321				
	440	5990	6382	6774				
	480	5322	5841					
	520	5876	6593					
	560							
	600							
	660							
	MIL	7278	6908	6043				
	V_{MAX}	552.4	528.5	467.0				

ACTUAL OAT DEG. C	TEMP. EFFECTS–FACTORS		
	CRUISE	MIL	$V_{MAX.}$
–80	.882	1.175	.921
–60	.926	1.142	.949
–40	.969	1.075	.976
–20	1.009	.961	1.005
–0	1.048	.800	1.028
–80	.900	1.157	.949
–60	.945	1.109	.971
–40	.988	1.015	.991
–20	1.030	.881	1.015
–0	1.070	.723	1.036
–80	.919	1.280	.973
–60	.966	1.120	.989
–40	1.010	.961	1.004
–20	1.052	.800	1.019
–0	1.043	.639	1.034
–80	.940	1.176	.932
–60	.987	1.038	.997
–40	1.032	.901	1.012
–20	1.075	.763	1.028
–0	1.117	.625	1.044
–80	.944	1.142	.978
–60	.992	1.019	.998
–40	1.037	.898	1.017
–20	1.081	.777	1.036
–0	1.122	.656	1.056

15A–1–(187)D

Figure A5-27

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

HIGH ALTITUDE CRUISE

GROSS WEIGHT - 60,000 POUNDS

REMARKS
ENGINES: (2) F100–PW–100

DATE: 24 JAN 1984
DATA BASIS: FLIGHT TEST

	KTAS	DRAG INDEX	TOTAL FUEL FLOW–LB/HR					
		0	20	40	60	80	100	120
20,000 FEET (–24.6° C)	360	5492	5849	6206	6563	6925	7303	7681
	400	5735	6193	6652	7110	7595	8080	8565
	440	6182	6765	7347	7960	8577	9227	9926
	480	6790	7544	8331	9131	10025	10943	11918
	520	7647	8658	9707	10929	12187	13480	14789
	560	8986	10472	12190	13962	15752		
	600	12499	15142					
	660							
	MIL	16636	16390	16126	15911	15761	15499	15245
	V_{MAX}	620.7	605.9	589.0	573.6	562.2	543.8	527.4
25,000 FEET (–34.5°C)	360	5561	5873	6185	6497	6825	7175	7525
	400	5478	5872	6282	6692	7121	7578	8035
	440	5715	6221	6747	7280	7863	8446	9066
	480	6116	6779	7454	8192	8940	9745	10561
	520	6831	7733	8710	9743	10837	11871	
	560	8071	9475	10994	12574			
	600	12407						
	660							
	MIL	14493	14212	13949	13740	13487	13187	12953
	V_{MAX}	612.6	595.5	579.1	566.4	551.6	534.6	521.7
30,000 FEET (–44.4° C)	360	6724	7032	7341	7661	7963	8275	8587
	400	5615	5895	6278	6665	7074	7483	7898
	440	5475	5942	6430	6927	7458	7991	8553
	480	5713	6310	6920	7587	8273	9005	9740
	520	6349	7143	8010	8942	9919		
	560	7794	9133	10589				
	600							
	660							
	MIL	12200	11952	11745	11468	11099	10833	10193
	V_{MAX}	595.2	579.8	567.1	552.5	535.2	522.6	491.8
35,000 FEET (–54.3°C)	360	9137	9396	9654	9913	10171	10430	
	400	6659	7016	7373	7730	8087	8445	
	440	5616	6070	6539	7020	7501	7982	
	480	5568	6153	6766	7398			
	520	6321	7130	7980				
	560	8175						
	600							
	660							
	MIL	9616	9331	8932	8665	7921	7484	
	V_{MAX}	572.4	557.5	536.4	521.7	480.3	452.3	
40,000 FEET (–56.4° C)	360							
	400							
	440							
	480	6196	6734					
	520	6661	7404					
	560							
	600							
	660							
	MIL	6910	6625					
	V_{MAX}	528.8	509.3					

	ACTUAL OAT DEG. C	TEMP EFFECTS – FACTORS		
		CRUISE	MIL	$V_{MAX.}$
20,000 FEET	–80	.882	1.175	.921
	–60	.926	1.142	.949
	–40	.969	1.075	.976
	–20	1.009	.961	1.005
	–0	1.048	.800	1.028
25,000 FEET	–80	.900	1.157	.949
	–60	.945	1.109	.971
	–40	.988	1.015	.991
	–20	1.030	.881	1.015
	–0	1.070	.723	1.036
30,000 FEET	–80	.919	1.280	.973
	–60	.966	1.120	.989
	–40	1.010	.961	1.004
	–20	1.052	.800	1.019
	–0	1.043	.639	1.034
35,000 FEET	–80	.940	1.176	.932
	–60	.987	1.038	.997
	–40	1.032	.901	1.012
	–20	1.075	.763	1.028
	–0	1.117	.625	1.044
40,000 FEET	–80	.944	1.142	.978
	–60	.992	1.019	.998
	–40	1.037	.898	1.017
	–20	1.081	.777	1.036
	–0	1.122	.656	1.066

15A–1–(222)A

Figure A5-28.

HIGH ALTITUDE CRUISE

GROSS WEIGHT - 65,000 POUNDS

REMARKS
ENGINES: (2) F100–PW–100

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

DATE: 24 JAN 1984
DATA BASIS: FLIGHT TEST

	KTAS	DRAG INDEX 0	TOTAL FUEL FLOW–LB/HR 20	40	60	80	100	120
20,000 FEET (−24.6° C)	360	5932	6289	6646	7013	7391	7768	8146
	400	6064	6524	6984	7463	7949	8436	8958
	440	6452	7032	7622	8237	8852	9535	10231
	480	7016	7765	8560	9365	10276	11197	12173
	520	7837	8855	9922	11147	12409	13697	15000
	560	9188	10708	12425	14192			
	600	12681	15308					
	660							
	MIL	16618	16377	16105	15894	15746	15460	15212
	V_{MAX}	619.7	605.1	587.7	572.4	561.0	541.3	525.3
25,000 FEET (−34.5°C)	360	6352	6665	7013	7363	7713	8067	8441
	400	5902	6314	6726	7160	7619	8078	8557
	440	6046	6576	7107	7683	8270	8880	9514
	480	6384	7057	7752	8491	9262	10064	10892
	520	7068	7966	8958	10008	11102	12231	
	560	8319	9736	11256	12837			
	600	12622						
	660							
	MIL	14466	14183	13922	13712	13429	13135	12883
	V_{MAX}	610.9	593.7	577.4	564.7	548.3	531.7	517.9
30,000 FEET (−44.4° C)	360	8272	8584	8896	9208	9520	9832	10144
	400	6310	6702	7113	7525	7944	8371	8797
	440	5933	6425	6927	7462	8001	8569	9136
	480	6070	6688	7334	8025	8752	9493	
	520	6674	7474	8390	9351	10345		
	560	8224	9582	11066				
	600							
	660							
	MIL	12141	11894	11689	11329	10987	10582	9292
	V_{MAX}	591.5	576.2	563.8	546.0	530.0	510.7	443.7
35,000 FEET (−54.3°C)	360	11260	11519	11777	12036	12294	12553	12811
	400	8182	8540	8898	9256	9614	9872	10330
	440	6479	6965	7452	7940	8428		
	480	6093	6712	7354	8005			
	520	6821	7678	8567				
	560	8671						
	600							
	660							
	MIL	9512	9124	8753	7969	7379	7080	6890
	V_{MAX}	566.9	546.6	526.9	483.2	444.7	423.3	409.6

ACTUAL OAT DEG. C	TEMP. EFFECTS–FACTORS CRUISE	MIL	$V_{MAX.}$
−80	.882	1.175	.921
−60	.926	1.142	.949
−40	.969	1.075	.976
−20	1.009	.961	1.005
−0	1.048	.800	1.028

−80	.900	1.157	.949
−60	.945	1.109	.971
−40	.988	1.015	.991
−20	1.030	.881	1.015
−0	1.070	.723	1.036

−80	.919	1.280	.973
−60	.966	1.120	.989
−40	1.010	.961	1.004
−20	1.052	.800	1.019
−0	1.043	.639	1.034

−80	.940	1.176	.932
−60	.987	1.038	.997
−40	1.032	.901	1.012
−20	1.075	.763	1.028
−0	1.117	.625	1.044

15A–1–(230)

Figure A5-29.

HIGH ALTITUDE CRUISE

GROSS WEIGHT - 70,000 POUNDS

REMARKS
ENGINES: (2) F100-PW-100

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

DATE: 24 JAN 1984
DATA BASIS: FLIGHT TEST

	KTAS	DRAG INDEX 0	TOTAL FUEL FLOW–LB/HR					
			20	40	60	80	100	120
20,000 FEET (−24.6° C)	360	6489	6847	7224	7602	7980	8362	8779
	400	6441	6802	7377	7865	8353	8867	9412
	440	6750	7334	7946	8564	9212	9912	10612
	480	7253	8012	8802	9636	10541	11474	12444
	520	8039	9066	10162	11380	12647	13930	
	560	9402	10956	12674	14435			
	600	12877	15488					
	660							
	MIL	16599	16364	16083	15877	15724	15419	15176
	V_{MAX}	618.6	604.2	586.2	571.0	559.3	538.6	523.0
25,000 FEET (−34.5°C)	360	7525	7875	8241	8615	8989	9363	9738
	400	6406	6819	7266	7727	8188	8677	9172
	440	6434	6969	7534	8125	8728	9367	10006
	480	6705	7384	8119	8865	9675	10491	11340
	520	7330	8250	9235	10304	11403	12525	
	560	8671	10109	11636	13221			
	600	12922						
	660							
	MIL	14431	14142	13881	13670	13353	13073	12723
	V_{MAX}	608.9	591.1	574.8	562.3	543.8	528.3	508.8
30,000 FEET (−44.4° C)	360	10107	10419	10732	11044	11356	11668	
	400	7404	7822	8251	8680	9110	9540	
	440	6472	6983	7523	8071	8644	9218	
	480	6493	7124	7823	8544	9294		
	520	7028	7894	8833	9827	10853		
	560	8701	10099					
	600							
	660							
	MIL	12070	11827	11626	11178	10861	8943	
	V_{MAX}	587.0	572.1	559.9	538.9	524.0	479.4	
35,000 FEET (−54.3°C)	360	13705	13963	14222				
	400	9996	10353	10711				
	440	7665	8159	8652				
	480	6735	7387					
	520	7359	8249					
	560							
	600							
	660							
	MIL	9368	8884	7902				
	V_{MAX}	559.4	533.9	479.1				

ACTUAL OAT DEG. C	TEMP. EFFECTS–FACTORS		
	CRUISE	MIL	$V_{MAX.}$
−80	.882	1.175	.921
−60	.926	1.142	.949
−40	.969	1.075	.976
−20	1.009	.961	1.005
−0	1.048	.800	1.028
−80	.900	1.157	.949
−60	.945	1.109	.971
−40	.988	1.015	.991
−20	1.030	.881	1.015
−0	1.070	.723	1.036
−80	.919	1.280	.973
−60	.966	1.120	.989
−40	1.010	.961	1.004
−20	1.052	.800	1.019
−0	1.043	.639	1.034
−80	.940	1.176	.932
−60	.987	1.038	.997
−40	1.032	.901	1.012
−20	1.075	.763	1.028
−0	1.117	.625	1.044

15A-1-(231)

Figure A5-30.

PART 6

ENDURANCE

MAXIMUM ENDURANCE CHARTS

These charts (figures A6-1 and A6-2) present optimum endurance altitude and maximum endurance specifics (fuel flow and Mach number) for various combinations of effective gross weight and altitude.

USE

Enter the Altitude and Bank Angle chart with the average gross weight. If bank angles are to be considered, follow the gross weight curve until it intersects the bank angle to be used, then project horizontally right to obtain effective gross weight. (If bank angles are not to be considered, enter the chart at the effective gross weight scale.) From this point proceed horizontally right to intersect the applicable drag index curve, then project vertically down to read optimum endurance altitude. Enter the fuel flow and Mach number plots on the Fuel Flow and Mach Number chart with the effective gross weight, then horizontally to intersect the optimum endurance altitude curve. From this point, project vertically down to intersect the applicable drag index curve, then horizontally to read fuel flow or true Mach number.

Sample Problem

Altitude and Bank Angle

A. Gross weight	40,000 Lb
B. Bank angle	20°
C. Effective gross weight	42,500 Lb
D. Drag index	20
E. Optimum endurance altitude	31,300 Ft

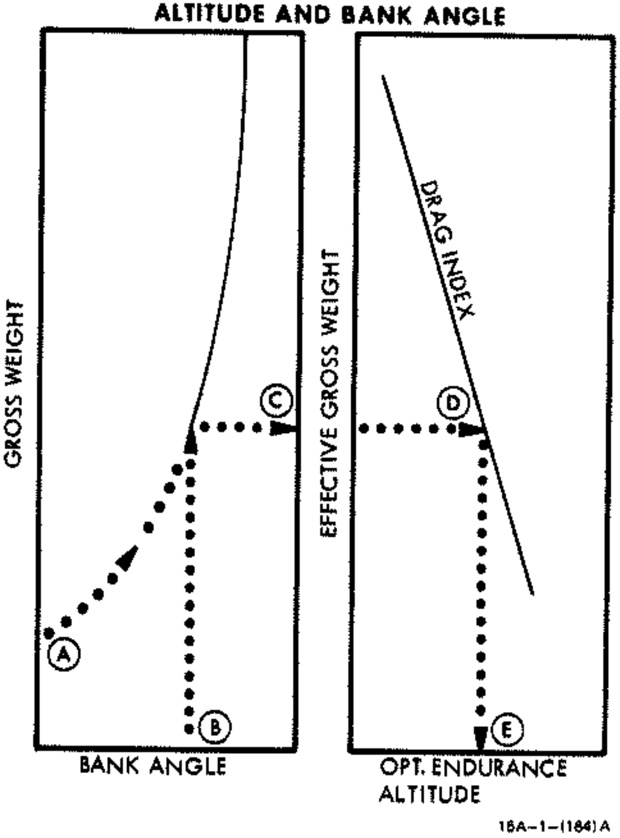
Fuel Flow

A. Effective gross weight	42,500 Lb
B. Endurance altitude	31,300 Ft
C. Drag index	20
D. Fuel flow	4025 PPH

Mach Number

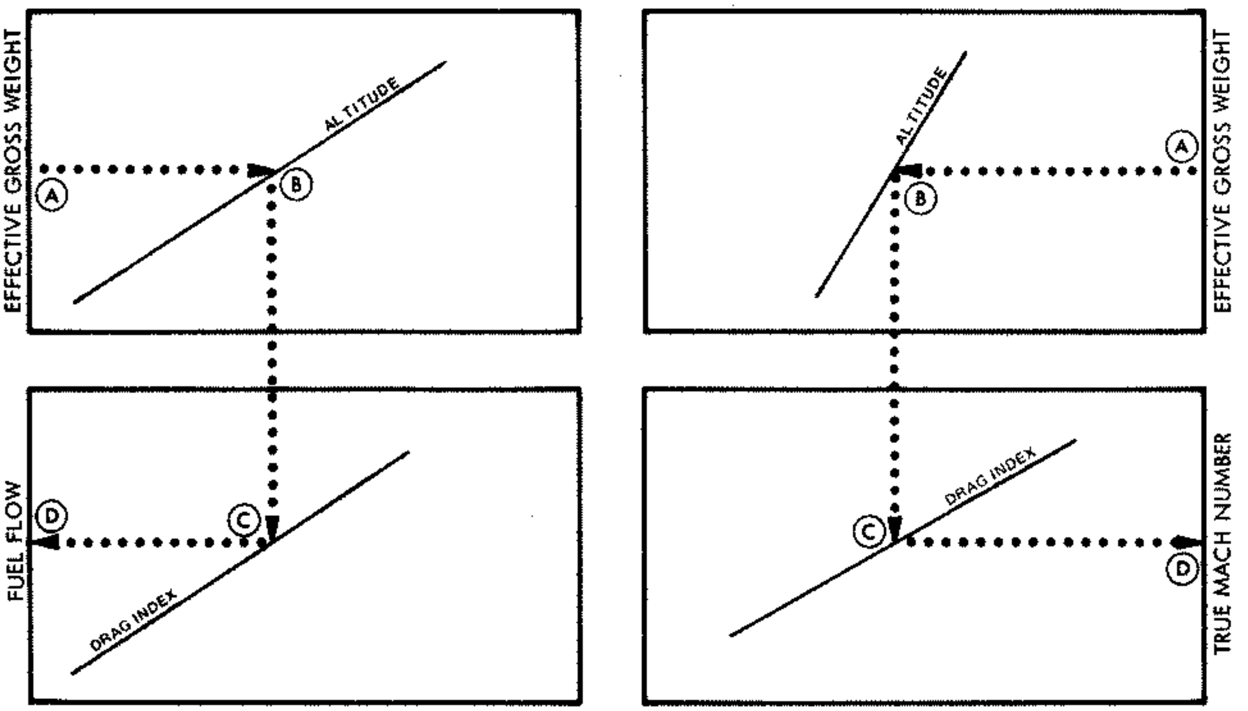
A. Effective gross weight	42,500 Lb
B. Endurance altitude	31,300 Ft
C. Drag index	20
D. True Mach number	0.621

SAMPLE MAXIMUM ENDURANCE



SAMPLE MAXIMUM ENDURANCE

FUEL FLOW AND TRUE MACH NUMBER



15A–1–(165) A

MAXIMUM ENDURANCE

ALTITUDE AND BANK ANGLE

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966

DATE: 24 JAN 1984
DATA BASIS: FLIGHT TEST

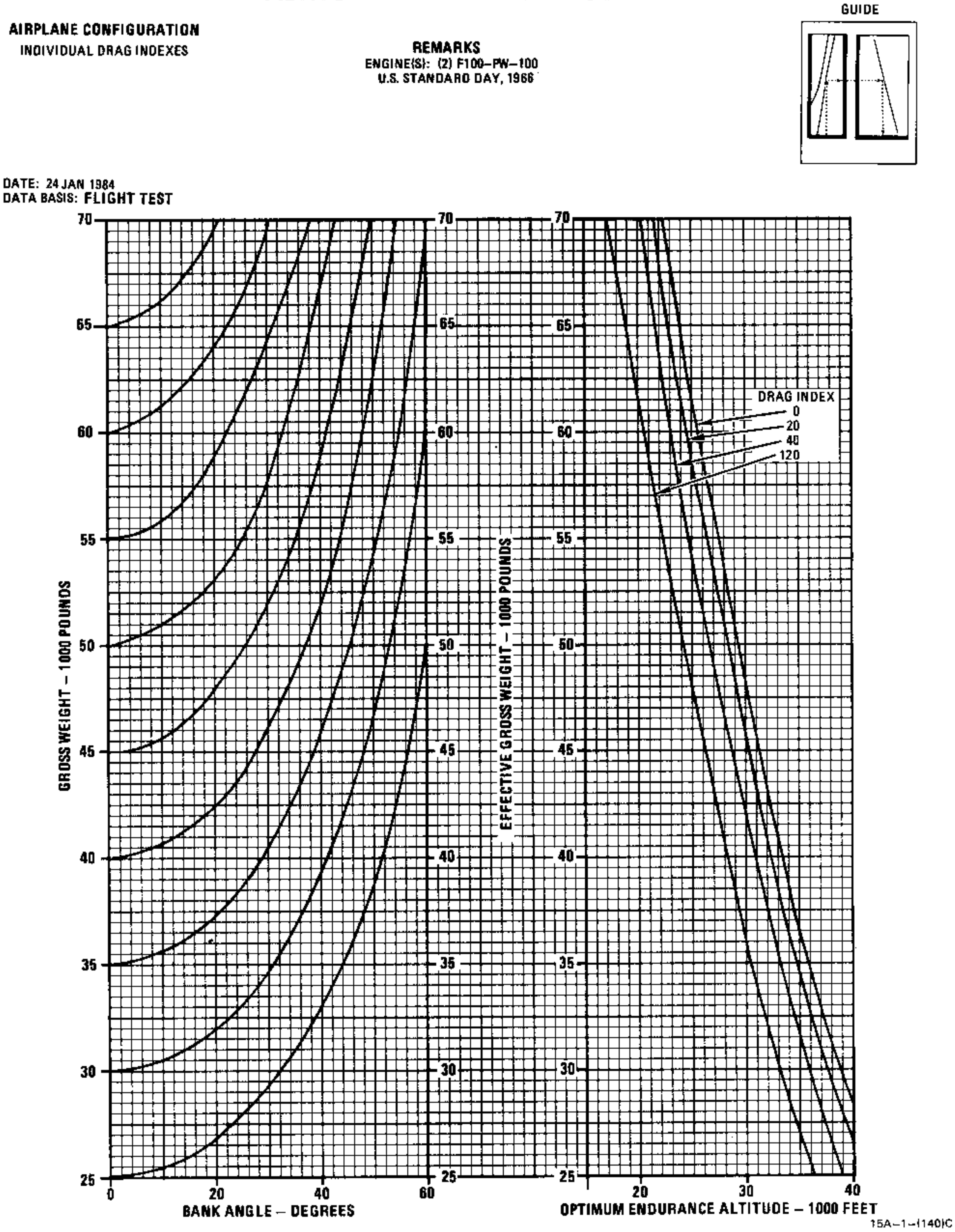


Figure A6-1

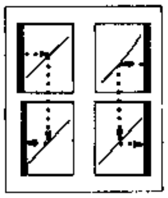
MAXIMUM ENDURANCE
FUEL FLOW AND TRUE MACH NUMBER

AIRPLANE CONFIGURATION
INDIVIDUAL DRAG INDEXES

REMARKS
ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966

DATE: 24 JAN 1984
DATA BASIS: **FLIGHT TEST**

GUIDE



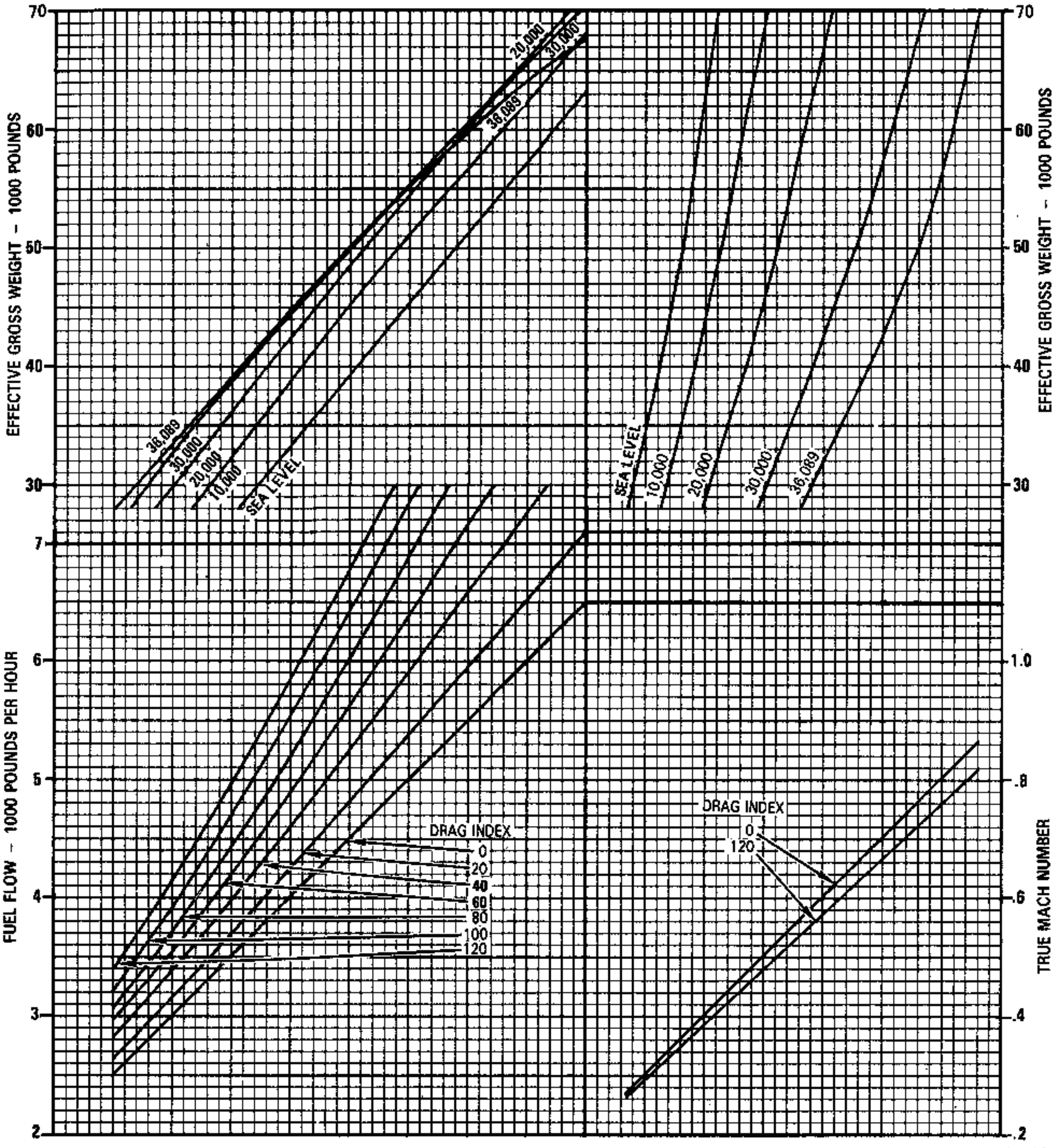


Figure A6-2

PART 7

DESCENT

DESCENT CHARTS

The Descent charts (figures A7-1 thru A7-4) present distance, time, total fuel used and Mach number in the descent. Incremental data may be obtained for distance, time and fuel by subtracting data corresponding to level-off altitude from the data for the original cruising altitude.

USE

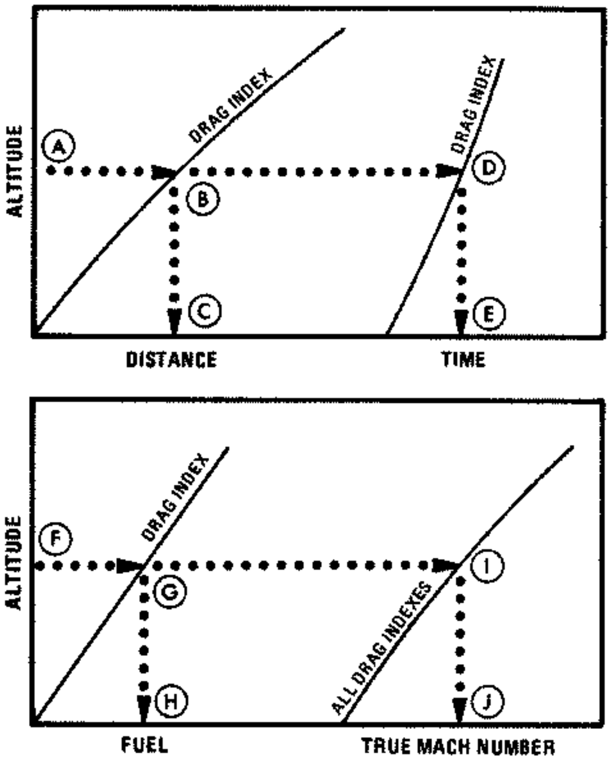
Enter the upper plot of the appropriate chart at the cruising altitude, project horizontally right to intersect both series of drag index curves. From the altitude - drag index intersection in the first series, project vertically down to read distance. From the altitude - drag index intersection in the second series, project vertically down to read time to descend. Enter the lower plot at the cruising altitude and project horizontally right to intersect the applicable drag index curve on the fuel graph. Continue horizontally right and intersect the curve on the Mach number graph. From the altitude - drag index intersection on the fuel graph, descend vertically and read total fuel used in the descent. From the intersection on the Mach number graph, project vertically down to read true Mach number.

Sample Problem

Maximum Range Descent, Idle Thrust, Speed Brake Retracted, F-15 without CFT

A. Altitude	30,000 Ft
B. Drag index	40
C. Distance	55 NM
D. Drag index	40
E. Time required	12.2 Min
F. Altitude	30,000 Ft
G. Drag index	40
H. Total fuel used	350 Lb
I. Drag reflector	
J. True Mach number	0.59 Mach

SAMPLE DESCENT



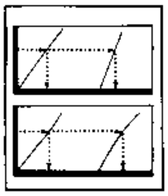
15A-1-(166) A

DESCENT
MAXIMUM RANGE
220 KCAS - IDLE THRUST
SPEED BRAKE RETRACTED

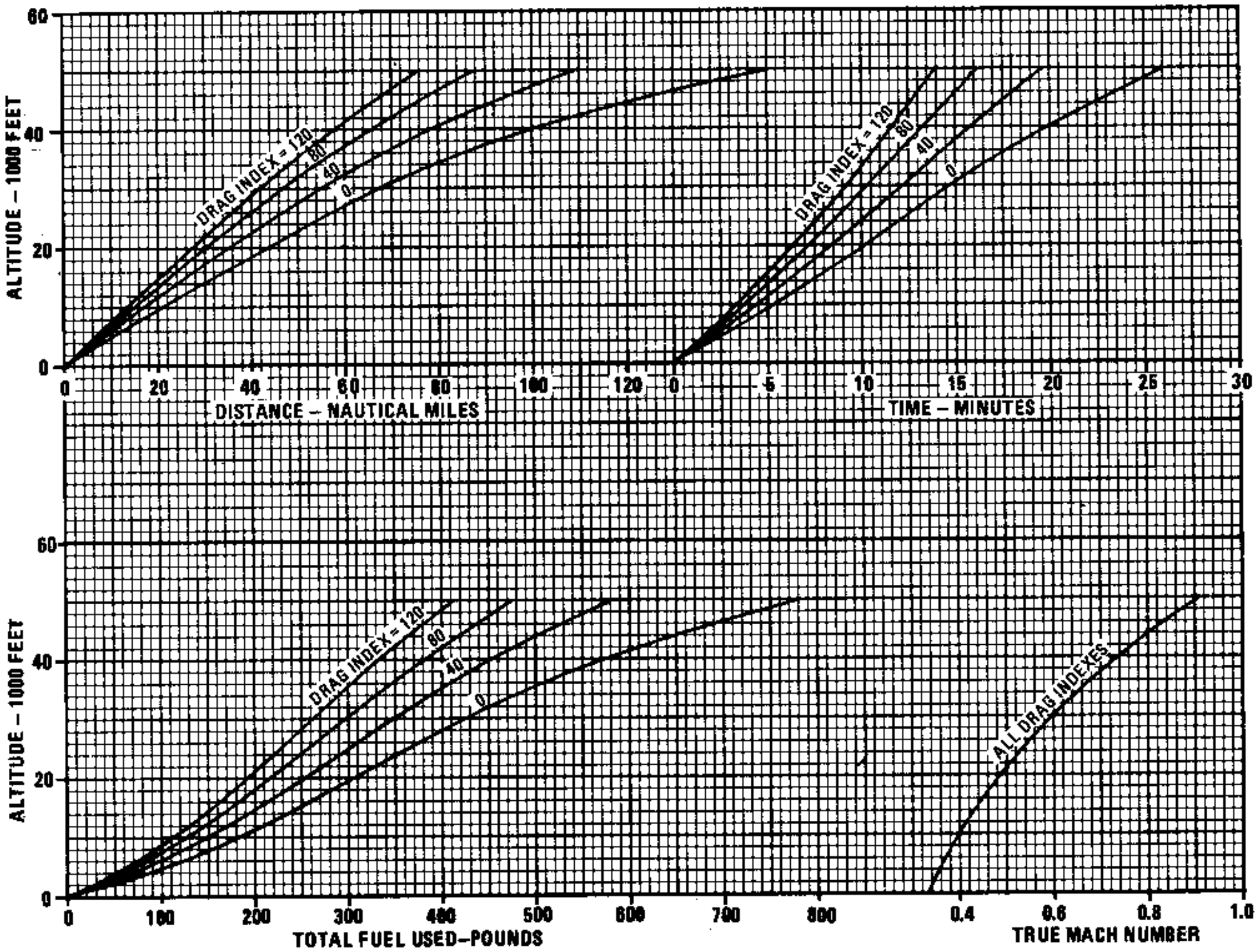
AIRPLANE CONFIGURATION
F-15 WITHOUT CFT

REMARKS
ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966

GUIDE



DATE: 19 JANUARY 1984
DATA BASIS: **FLIGHT TEST**



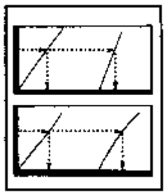
15A–1–(138–1)C

Figure A7-1. Descent (Sheet 1 of 2)

DESCENT

MAXIMUM RANGE
220 KCAS-IDLE THRUST
SPEED BRAKE RETRACTED

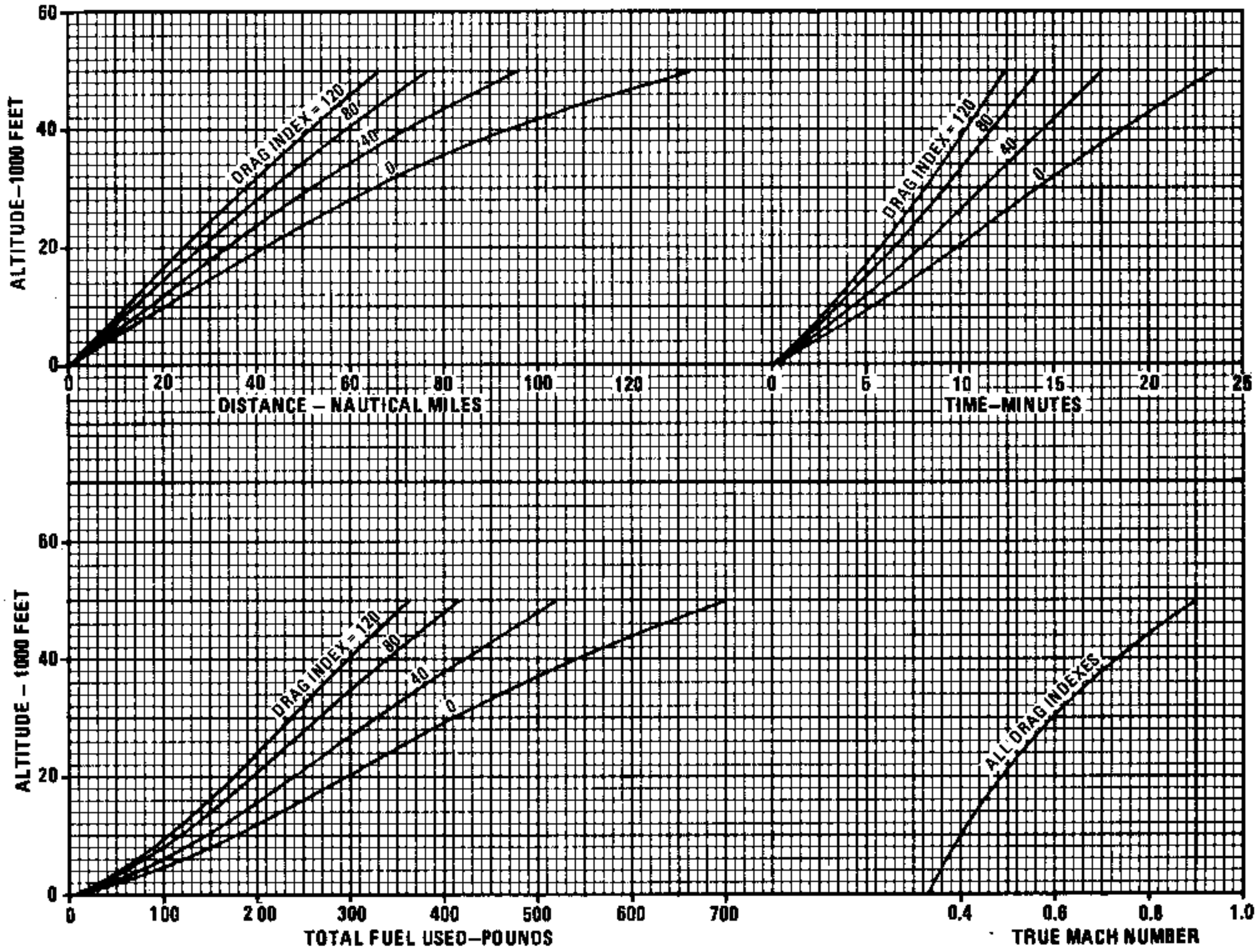
GUIDE



AIRPLANE CONFIGURATION
F–15 WITH CFT

REMARKS
ENGINE(S): (2) F100–PW–100
U.S. STANDARD DAY, 1966

DATE: 19 JAN 1984
DATA BASIS: **FLIGHT TEST**



15A–1–(138–2)C

Figure A7-1. Descent (Sheet 2)

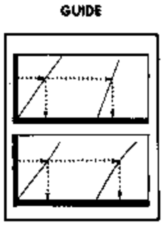
DESCENT

220 KCAS - IDLE THRUST SPEED BRAKE EXTENDED

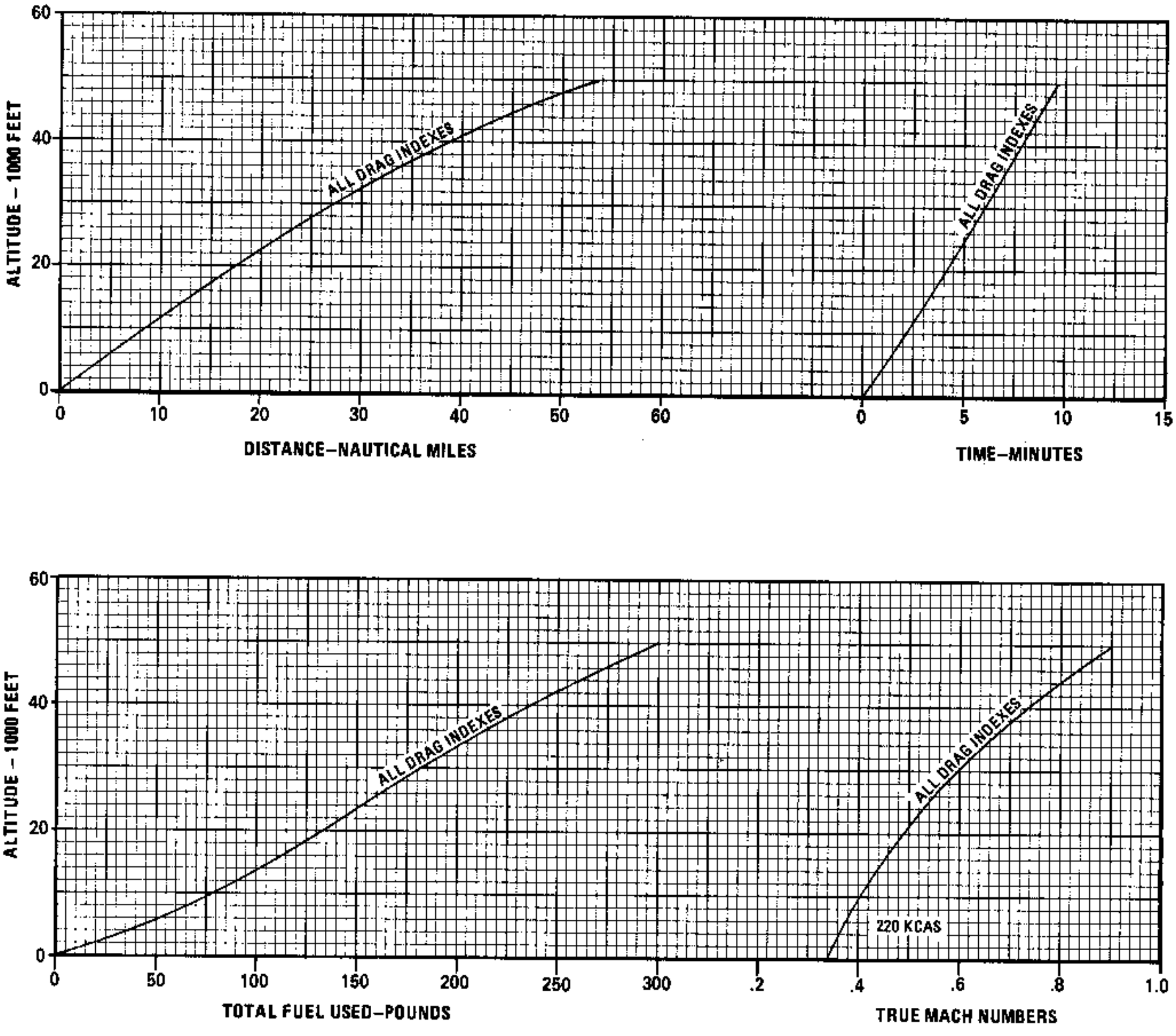
AIRPLANE CONFIGURATION
ALL DRAG INDEXES

REMARKS
ENGINE(S): (2) F100-PW-100
U. S. STANDARD DAY, 1966

GUIDE



DATE: 19 JANUARY 1984
DATA BASIS: FLIGHT TEST



15A–1–(149)C

Figure A7-2

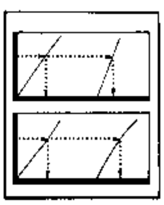
DESCENT

220 KCAS - 70% RPM
SPEED BRAKE EXTENDED

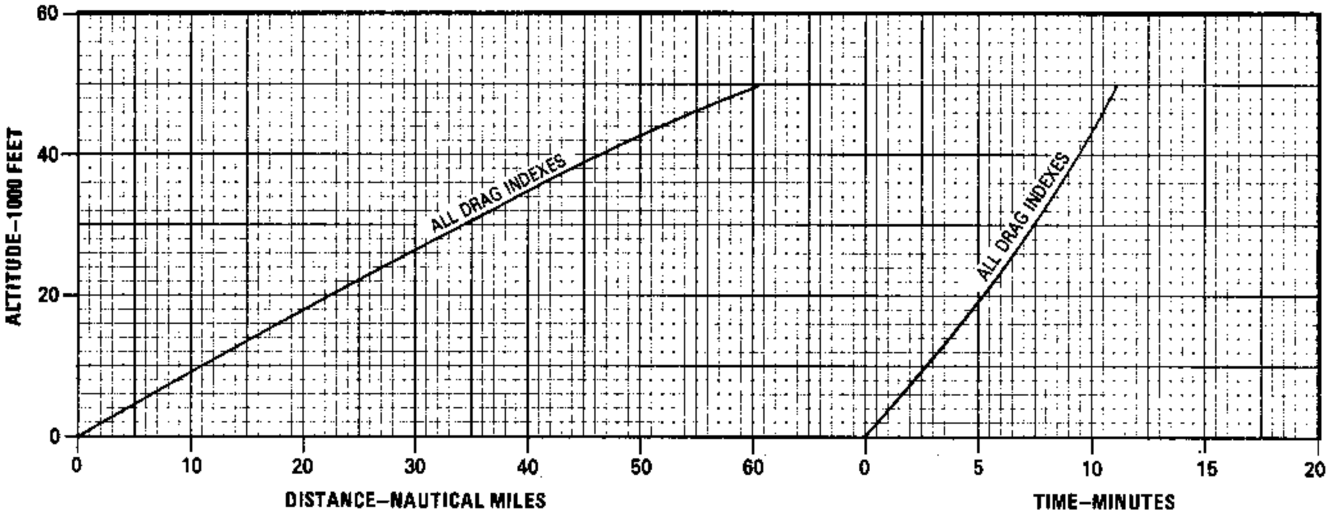
AIRPLANE CONFIGURATION
ALL DRAG INDEXES

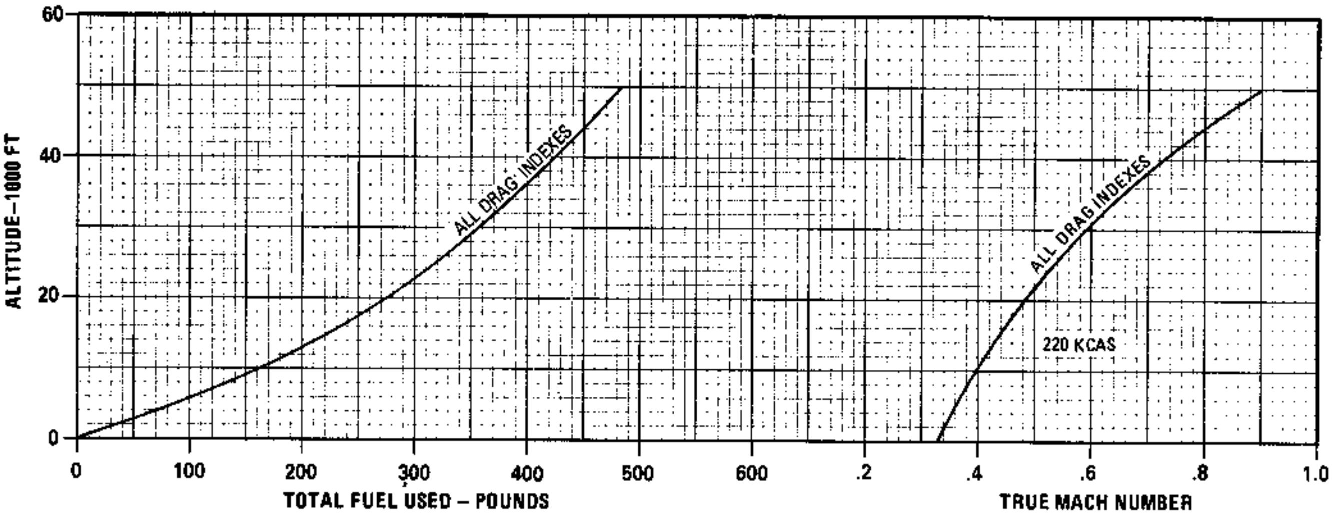
REMARKS
ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966

GUIDE



DATE: **19 JAN 1984**
DATA BASIS: **FLIGHT TEST**





15A–1–(160)

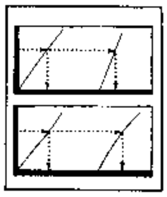
Figure A7-3

DESCENT
300 KCAS - 70% RPM
SPEED BRAKE RETRACTED

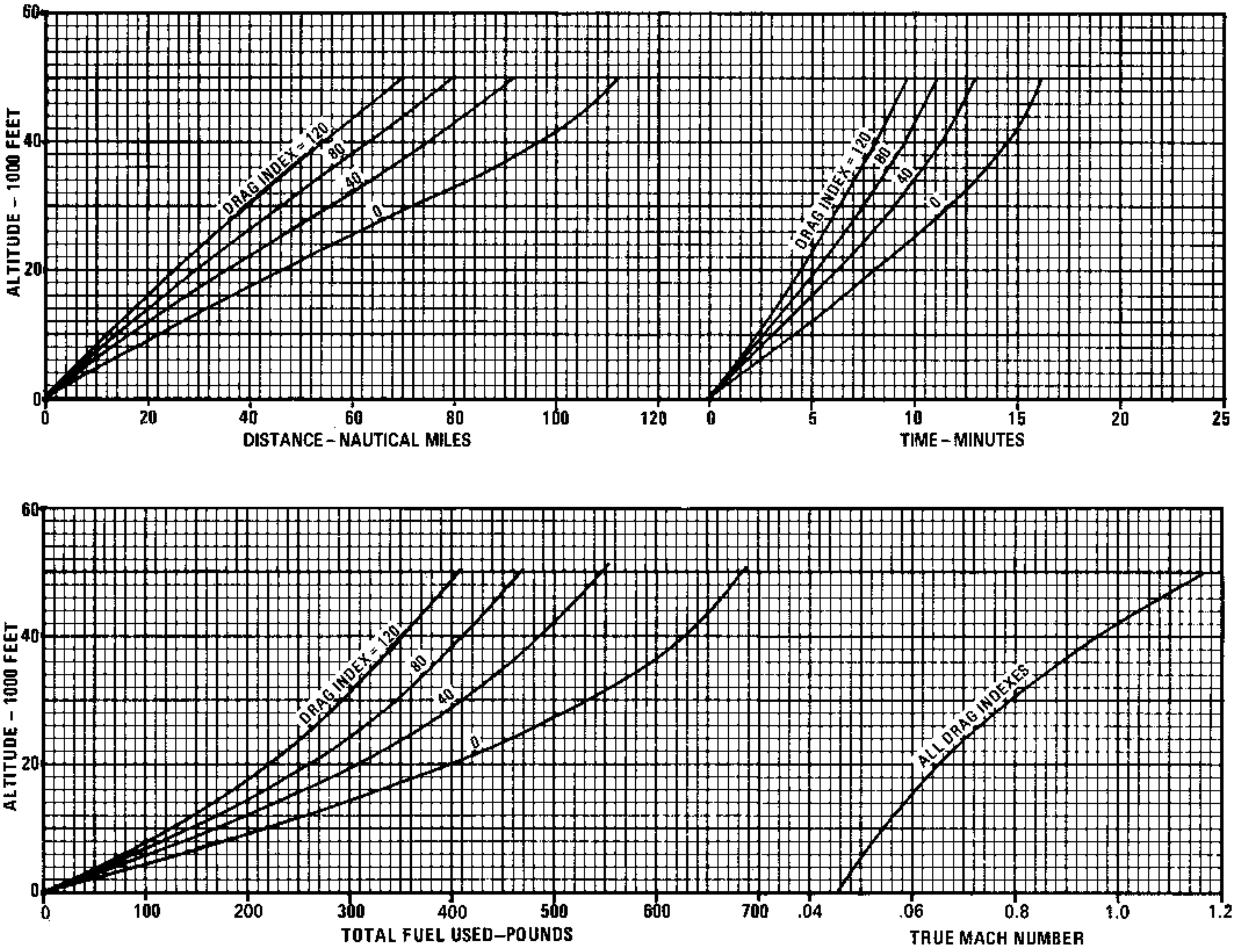
AIRPLANE CONFIGURATION
F–15 WITHOUT CFT

REMARK
ENGINE(S): (2)F100–PW–100
U.S. STANDARD DAY, 1966

GUIDE



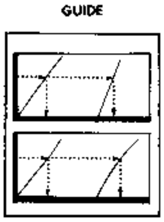
DATE: 19 JAN 1984
DATA BASIS: **FLIGHT TEST**



15A-1-(215-1)A

Figure A7-4. Descent (Sheet 1 of 2)

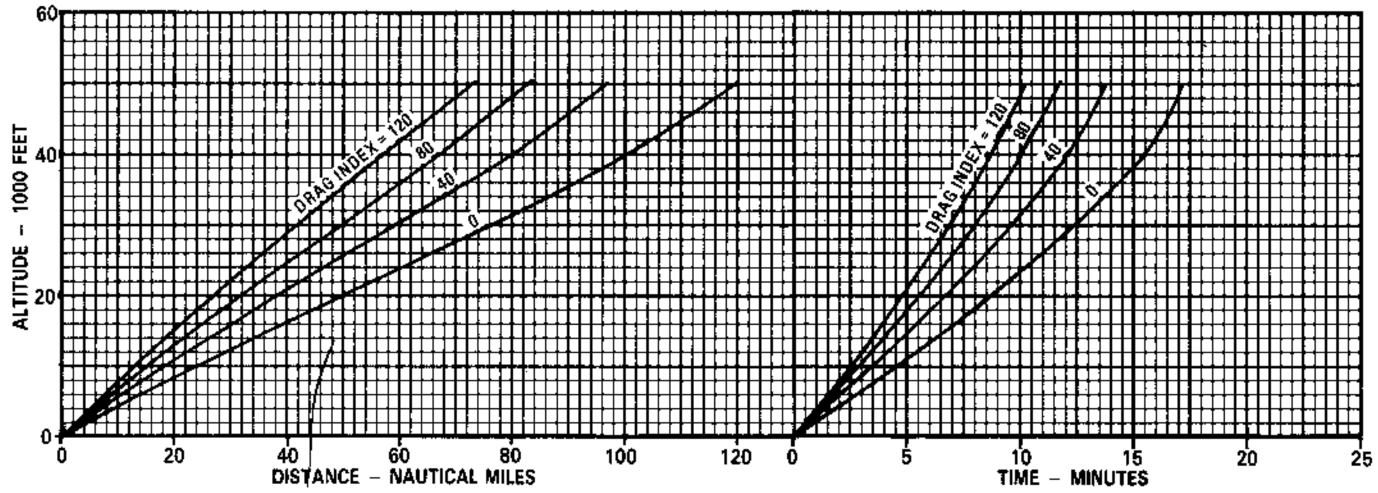
DESCENT
300 KCAS - 70% RPM
SPEED BRAKE RETRACTED

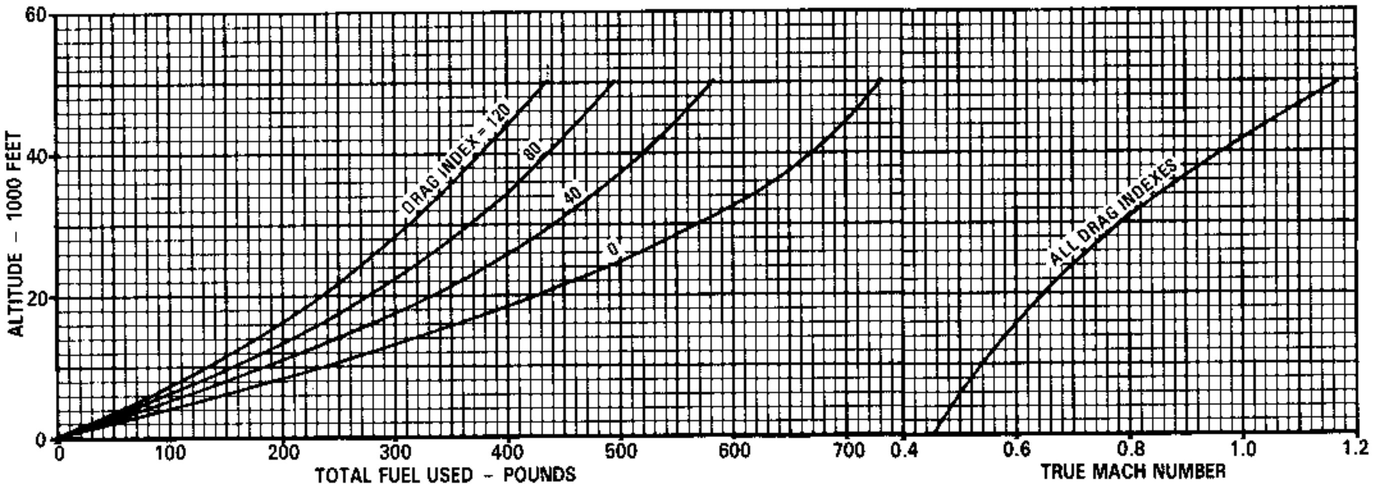


AIRPLANE CONFIGURATION
F–15 WITH CFT

REMARK
ENGINE(S): (2)F100–PW–100
U.S. STANDARD DAY, 1966

DATE: 19 JAN 1984
DATA BASIS: **FLIGHT TEST**





15A–1–(215–2)A

Figure A7-4. Descent (Sheet 2)

PART 8

APPROACH AND LANDING

TABLE OF CONTENTS

Charts

Landing Approach Speed............................ A8-3
Landing Distance... A8-4

LANDING APPROACH SPEED CHARTS

The Landing Approach Speed chart (figure A8-1) provides recommended approach speed for various gross weights of the aircraft. The data is plotted for flops either up, or down.

USE

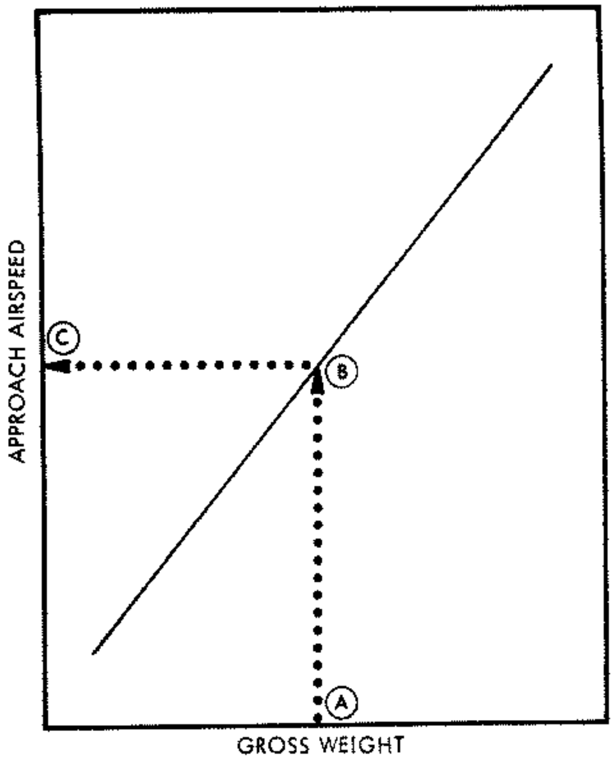
Enter the chart at the estimated landing gross weight and project vertically up to the appropriate flap reflector line. From this point, project horizontally left to read recommended approach speed.

Sample Problem

Configuration: Flaps Down

A. Estimated landing gross weight	30,000 Lb
B. Flaps down reflector line	
C. Landing approach speed	130.5 Kt

SAMPLE APPROACH SPEEDS



15A-1-(187)

LANDING DISTANCE CHART

These charts (figures A8-2 and A8-3) provide landing roll distance information. One chart provides data for a normal landing utilizing aerodynamic braking. The other provides data for a landing roll utilizing the technique of lowering the nose immediately after touchdown and applying maximum anti-skid braking. The variables of temperature, altitude, gross weight, effective wind, and runway condition are taken into consideration.

USE

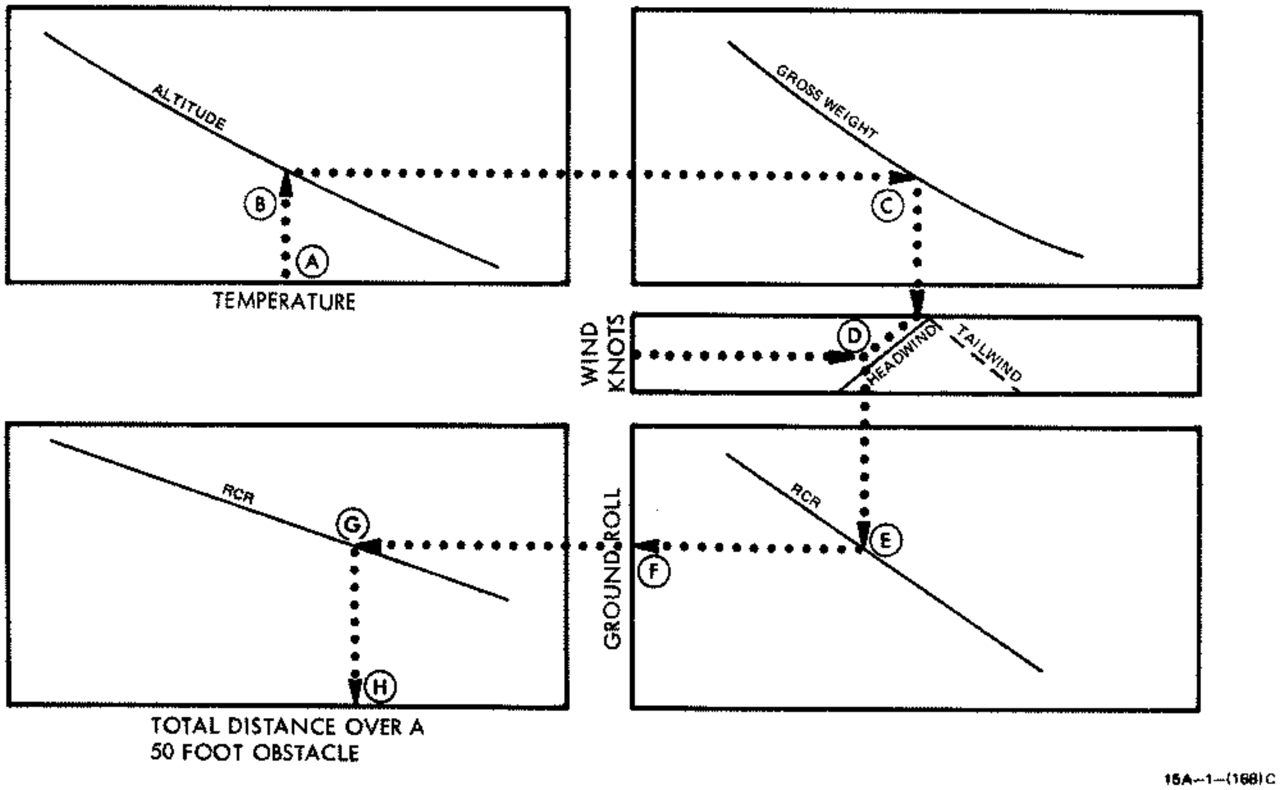
Enter the chart with the runway temperature and project vertically up to the applicable pressure altitude. From this point, proceed horizontally right to the landing gross weight, then descend vertically to the wind baseline. Parallel the nearest guideline down to the effective headwind or tailwind for the appropriate runway condition. From this point, project vertically down to the appropriate runway condition reflector, then horizontally left to read ground roll. Continue further left to the appropriate runway condition reflector, then vertically down to read total distance required when landing over a 50 foot obstacle.

Sample Problem

Normal Landing

A. Temperature	20°C
B. Pressure altitude	2000 Ft
C. Gross weight	30,000 Lb
D. Effective headwind (DRY)	15 Kt
E. RCR reflector (DRY)	26
F. Landing distance	3300 Ft
G. RCR Reflector (DRY)	
H. Total distance required over a 50-foot obstacle	4000 Ft

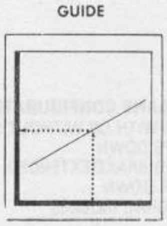
SAMPLE LANDING DISTANCE



LANDING APPROACH SPEED

AIRPLANE CONFIGURATION
■ F-15 WITH OR WITHOUT CFT
ALL DRAG INDEXES
21 UNITS AOA

REMARKS
ENGINE(S): (2) F100-PW-100
■ DATA APPLICABLE FOR ANY ENGINE TRIM



■ DATE: 23 AUGUST 1985
DATA BASIS: **FLIGHT TEST**

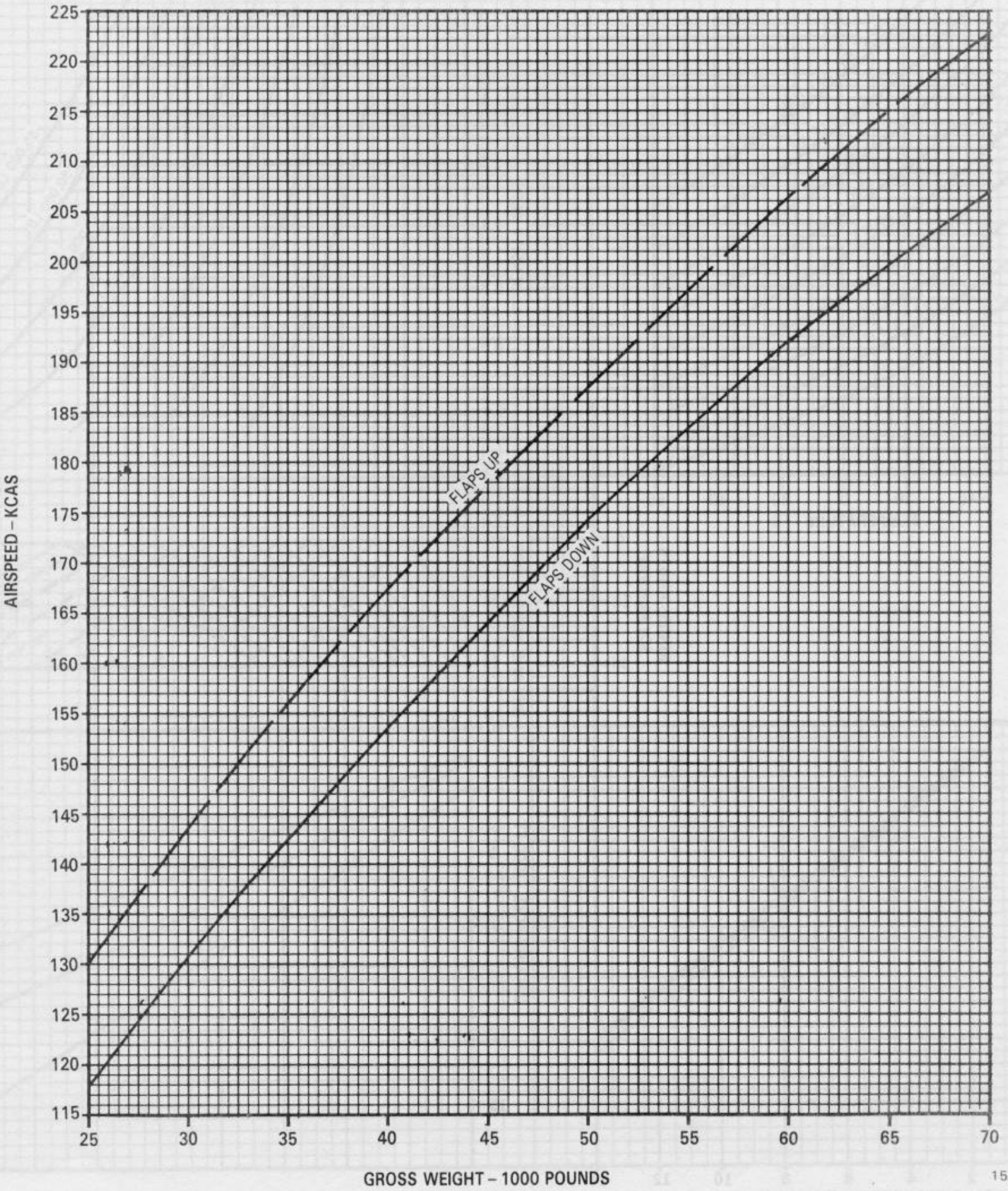


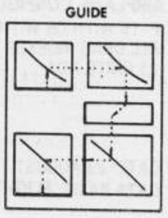
Figure A8-1

LANDING DISTANCE

AERODYNAMIC BRAKING

IDLE THRUST

GROSS WEIGHT — 25,000 TO 55,000 POUNDS■



AIRPLANE CONFIGURATION
■ F-15 WITH OR WITHOUT CFT
FLAPS DOWN
SPEED BRAKE EXTENDED
GEAR DOWN
ALL DRAG INDEXES

DATE: 1 JULY 1981
DATA BASIS: **FLIGHT TEST**

REMARKS
ENGINE(S): (2)F100-PW-100
■ DATA APPLICABLE FOR ANY ENGINE TRIM

NOTE
DATA IS BASED ON THE USE OF AERODYNAMIC BRAKING BY RAISING THE NOSE TO A 14° PITCH ATTITUDE AFTER TOUCHDOWN AND MAINTAINING ■ AS LONG AS POSSIBLE.

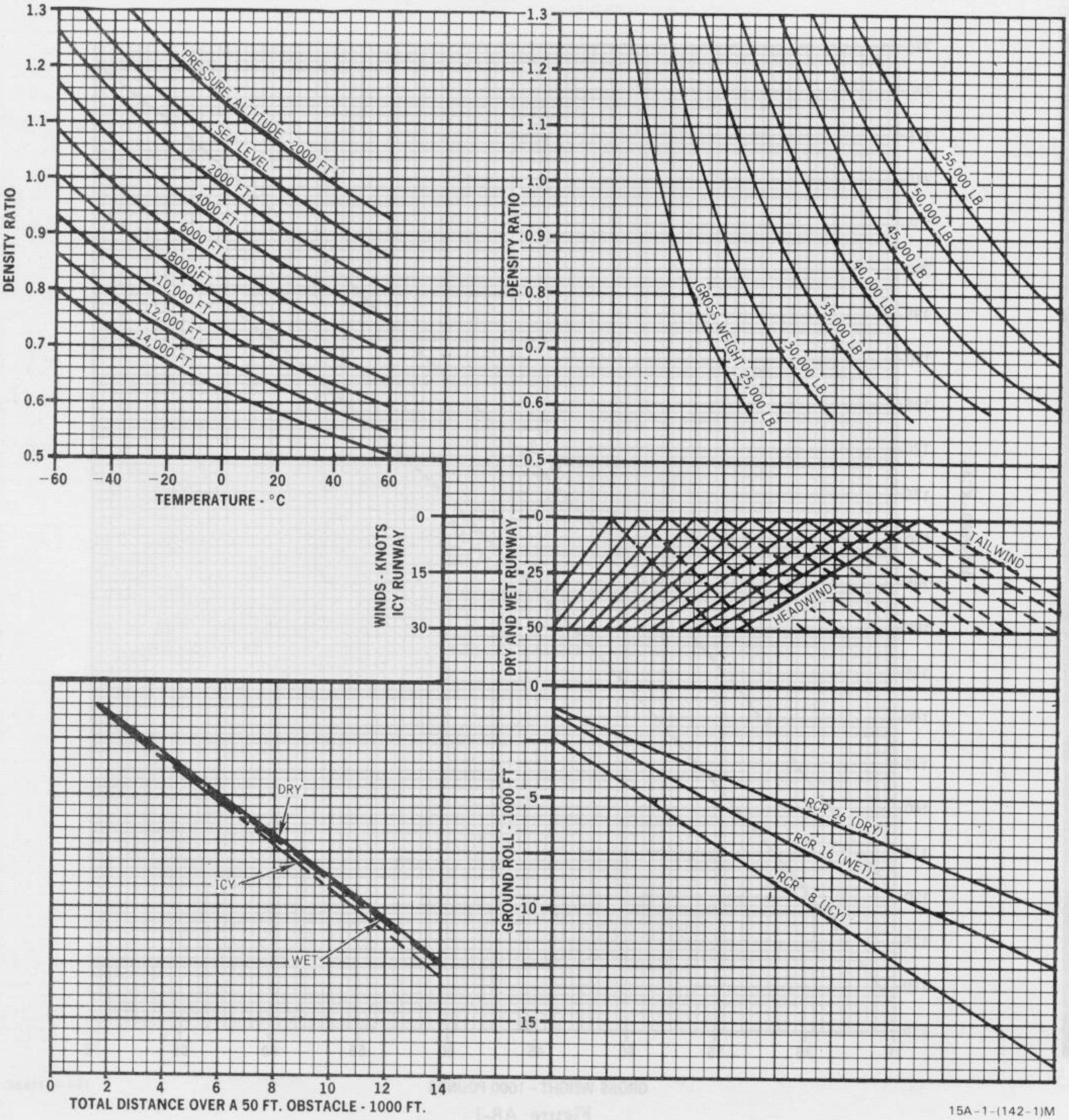


Figure A8-2 (Sheet 1 of 2)

LANDING DISTANCE
AERODYNAMIC BRAKING
IDLE THRUST
GROSS WEIGHT — 55,000 TO 70,000 POUNDS

AIRPLANE CONFIGURATION
F-15 WITH OR WITHOUT CFT
FLAPS DOWN
SPEED BRAKE EXTENDED
GEAR DOWN
ALL DRAG INDEXES

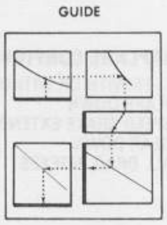
DATE: 23 AUGUST 1985
DATA BASIS: **FLIGHT TEST**

REMARKS

ENGINE(S): (2)F100-PW-100
DATA APPLICABLE FOR ANY ENGINE TRIM

NOTE

DATA IS BASED ON THE USE OF AERODYNAMIC BRAKING BY RAISING THE NOSE TO A 14° PITCH ATTITUDE AFTER TOUCHDOWN AND MAINTAINING AS LONG AS POSSIBLE.



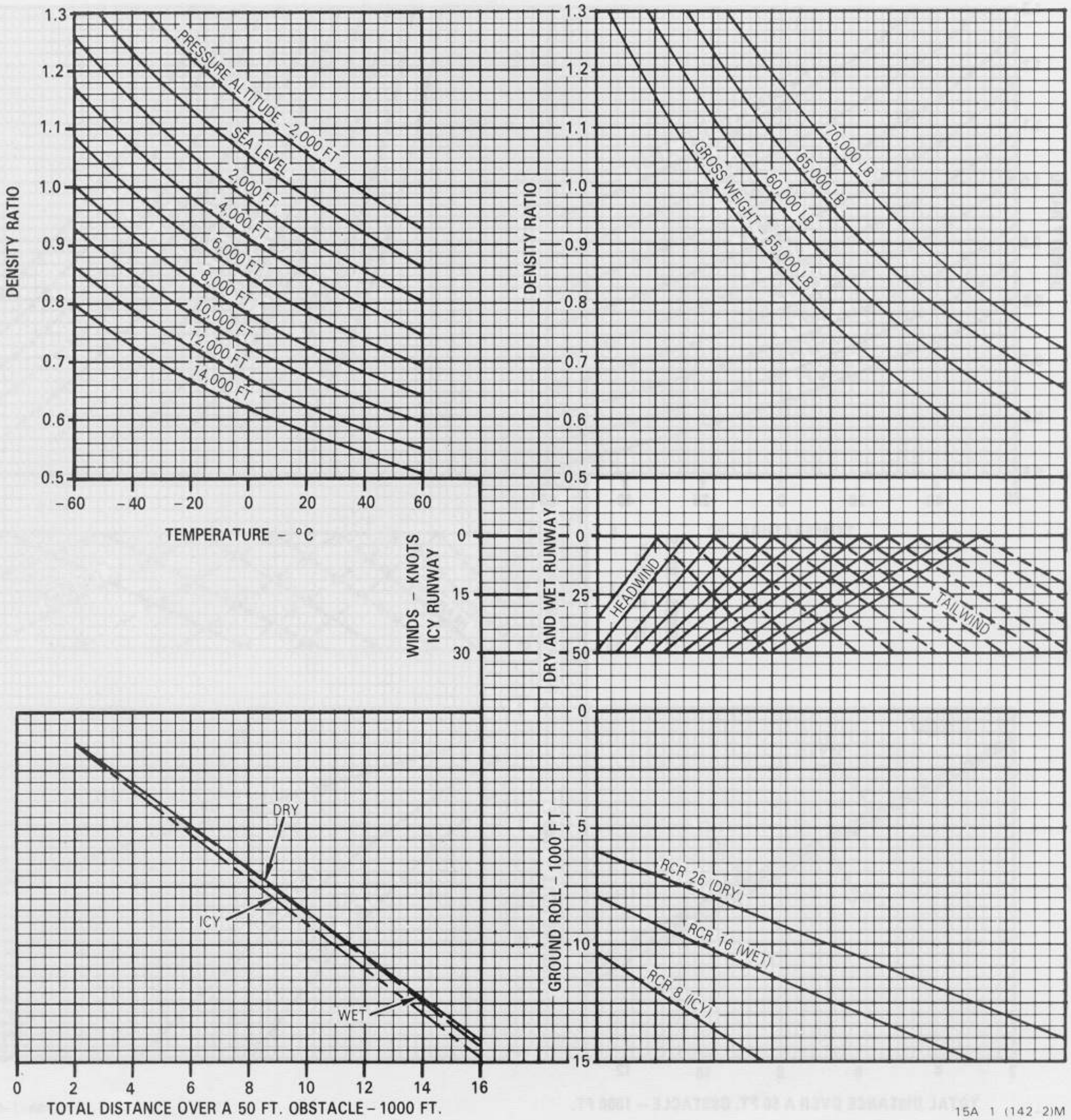


Figure A8-2 (Sheet 2)

LANDING DISTANCE

MAXIMUM ANTI-SKID BRAKING

IDLE THRUST

AIRPLANE CONFIGURATION

- F-15 WITH OR WITHOUT CFT
  FLAPS DOWN
  SPEED BRAKE EXTENDED
  GEAR DOWN
  ALL DRAG INDEXES

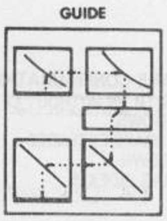
REMARKS

ENGINE(S): (2) F100-PW-100

- DATA APPLICABLE FOR ANY ENGINE TRIM

NOTE

DATA IS BASED ON LOWERING THE NOSE IMMEDIATELY AFTER TOUCHDOWN AND APPLYING MAXIMUM ANTI-SKID BRAKING.



- DATE: 23 AUGUST 1985
  DATA BASIS: **FLIGHT TEST**

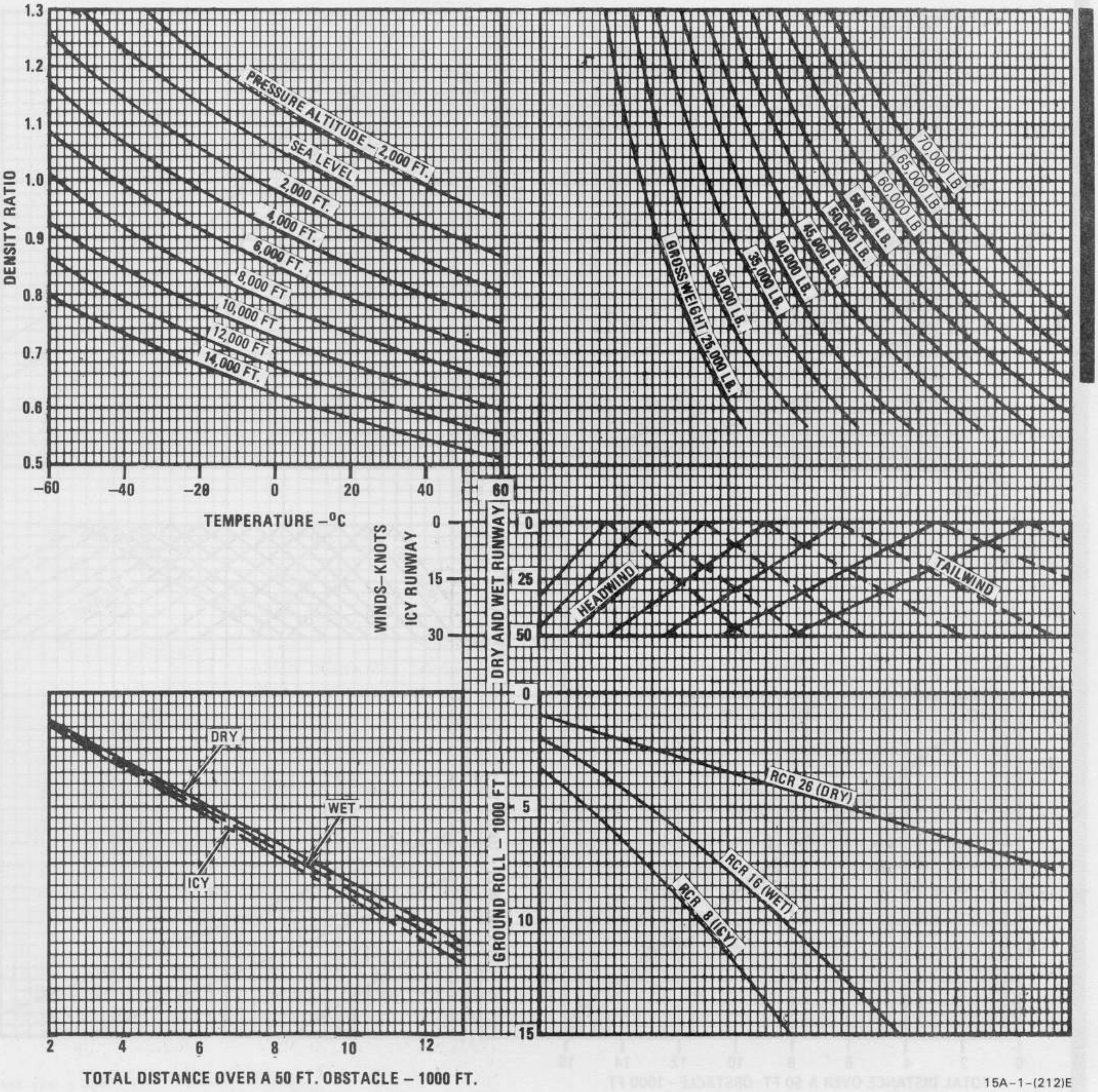


Figure A8-3

PART 9

COMBAT PERFORMANCE

TABLE OF CONTENTS

Charts

Level Flight Envelope..................................A9-4C
Dive Recovery...A9-6
Low Altitude Combat Performance...........A9-9
Combat Fuel Management............................A9-10A
Combat Fuel Flow...A9-10B
Overload Warning System
  Symmetrical Allowable Load
  Factor...A9-12
Level Flight Acceleration A9-14
Sustained Level Turns.................................A9-35

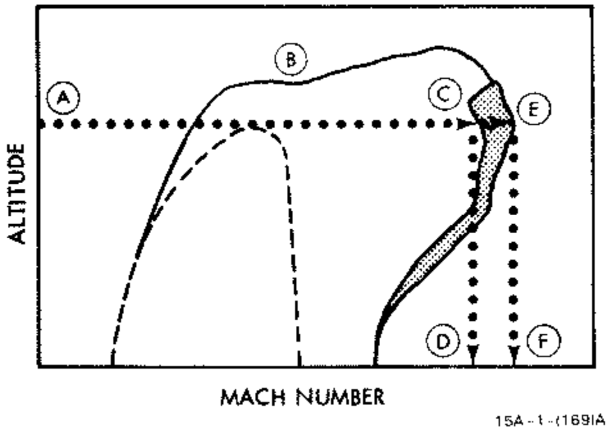
LEVEL FLIGHT ENVELOPE

These charts (figures A9-1 thru A9-1F) present the aircraft level flight speed envelope for various configurations and average combat gross weights. Parameters of the envelopes extend from the maximum lift coefficient to maximum thrust Mach number at 0g acceleration throughout the altitude range. For each engine trim, envelopes are presented for a standard day and standard day ±10°C. In addition to the maximum attainable Mach number at 0g acceleration, each standard day curve indicates Mach number at .03g acceleration. Figure A9-1G shows the relationship between maximum Mach number and Vmax for a selected configuration.

USE

Enter the chart with the desired combat altitude and project horizontally to intersect the applicable standard day .03g and 0g acceleration power curves. From these points, proceed vertically down to read the .03g Mach number and the maximum attainable Mach number in level flight.

SAMPLE LEVEL FLIGHT ENVELOPE



Sample Problem

Configuration: (4) AIM-7, (4) AIM-9 and ℄ Pylon; 39,000 Pounds, Gross Weight, 97.7% Engine Trim

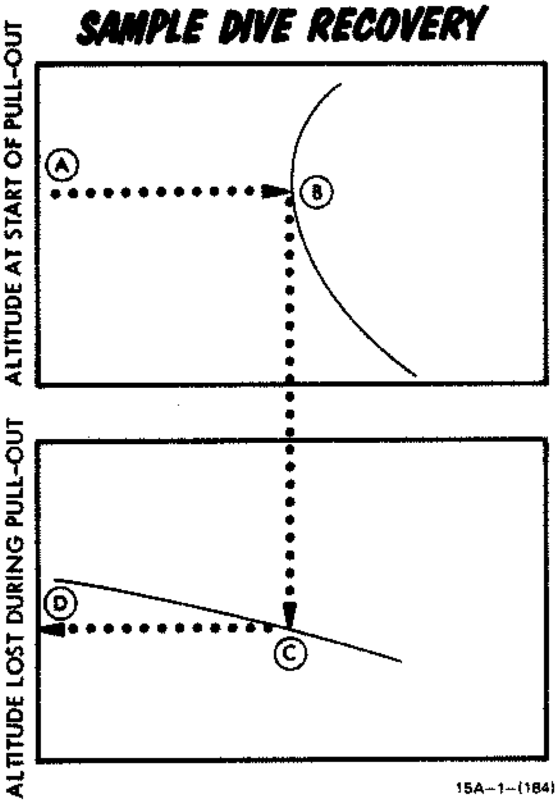
A. Combat altitude	35,000 Ft
B. Curve	Std day
C. .03g Acceleration Curve	
D. .03g Acceleration Mach number	1.65
E. 0g Acceleration curve	
F. 0g Acceleration Mach number	1.75

DIVE RECOVERY CHARTS

These charts, (figures A9-2 thru A9-4) present the airplanes dive recovery capability for various speeds (subsonic and supersonic), altitudes, and dive angles. The supersonic chart (figure A9-3) includes airplane structural limit curves to determine the maximum dive angle that can be achieved without exceeding the structural limit speed during dive recovery. Chart A9-4 presents emergency pull-out data for gross weights of 34,000 to 38,000 pounds for dive angles of 30°, 60° and 90° using full aft stick or 10g's with power settings of maximum afterburner below initial airspeeds of 350 knots and idle above initial airspeeds of 350 knots. Chart A9-4A presents emergency pull-out data for gross weights of 50,000 to 54,000 pounds. The low speed recovery procedure is the same as for the low gross weight chart, but the procedures for above 350 KCAS are somewhat different. Between 350 KCAS and 500 KCAS, idle power is selected immediately while at the same time applying full aft stick or 10g's to wing rock. At airspeeds above 500 KCAS, idle power is selected immediately while at the same time applying 7g's. A note is included on chart A9-4A defining emergency pull-out procedures for a 60,000 pound aircraft, which are the same as for a 50,000 to 54,000 pound arcraft except the maximum load factor below 500 KCAS is 8.7g and the maximum load factor above 500 KCAS is 6g. Included in the note is a procedure for rough calculation of additional altitude loss over that shown on the chart for a 50,000 to 54,000 pound aircraft. An important procedural difference to note for the heavier gross weight emergency pull-out is the CAS should be ON.

USE

Enter the applicable chart with the altitude at the start of the pull-out and project horizontally right to intersect the curve for the Mach number at the start of the pull-out. From this point, project vertically down to intersect the dive angle at the start of pull-out, then horizontally left to read altitude lost during pull-out.



Sample Problem

Configuration: (4) AIM-9 Launchers; Supersonic

A. Altitude at start of pull-out	40,000 Ft
B. Mach number at start of pull-out	1.5
C. Dive angle at start of pull-out	70°
D. Altitude loss during pull-out	11,000 Ft

LOW ALTITUDE COMBAT PERFORMANCE CHART

This table (figure A9-5) presents specific fuel flow values (pounds per minute) for maximum thrust operation at constant calibrated airspeeds of 300, 400, 500, 600, and 700 knots. The data are for altitudes of sea level, 5000 and 10,000 feet. Fuel flow values are computed for U.S. Standard Day; however, correction factors are given for nonstandard day temperatures. The standard day temperature is listed with the altitude. If the actual temperature at a particular altitude differs from the standard day temperature, refer to the TEMP. EFFECTS column to determine the appropriate temperature correction factor.

USE

Enter the table with the desired altitude and calibrated airspeed and project horizontally right to the specific fuel flow column to read specific fuel flow for a standard day. To obtain the specific fuel flow for a nonstandard day, multiply the specific fuel flow for a standard day by the nonstandard day temperature correction factor obtained from the TEMP. EFFECTS column.

Sample Problem

A. Desired altitude	5000 Ft
B. Desired constant airspeed	600 KCAS
C. Specific fuel flow for a standard day	1861 Lb/Min
D. Nonstandard day temperature	0°C
E. Nonstandard day temperature correction factor	1.03
F. Nonstandard day specific fuel flow (C X E)	1917 Lb/Min

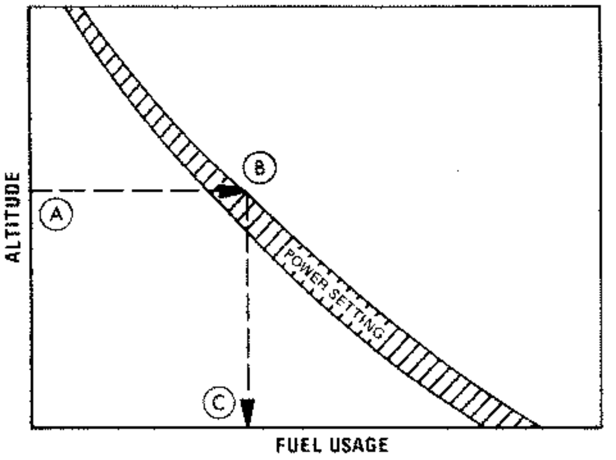
COMBAT FUEL MANAGEMENT CHART

This chart (figure A9-6) presents a relative comparison between engine power setting and fuel usage in pounds per minute. The chart emphasizes the effect of power setting on combat fuel management. Data presented are for engine power settings of military power, mid-range afterburner and maximum afterburner at altitudes from sea level to 40,000 feet and airspeeds between Mach 0.8 and Mach 1.1.

USE

Enter the chart at the desired altitude and project horizontally right to the selected Mach/engine power setting. From this point project vertically down to read fuel usage in pounds per minute.

SAMPLE COMBAT FUEL MANAGEMENT



15A-1-(217)A

Sample Problem

A. Desired altitude	25,000 Ft
B. Mach/power setting	0.9/Max AB
C. Fuel usage	1020PPM

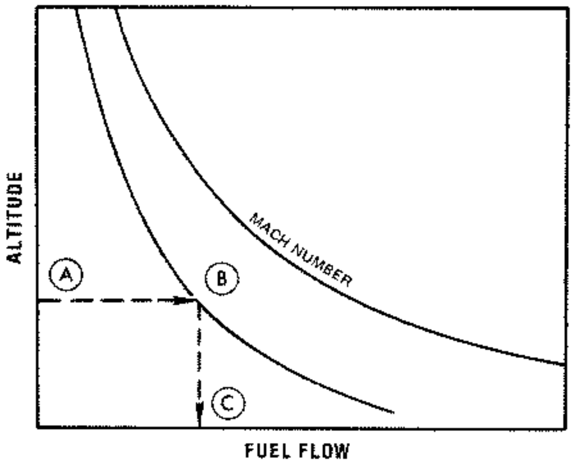
COMBAT FUEL FLOW CHART

These charts (figure A9-7) present a relative comparison between high airspeeds at stabilized level flight and fuel flow in pounds per minute. Data presented are for three non-CFT configurations and two CFT configurations, based on a 97.7% engine trim.

USE

Enter the chart at the desired altitude and project horizontally right to the selected Mach number curve. From this point project vertically down to read fuel flow in pounds per minute.

SAMPLE COMBAT FUEL FLOW



15A-1-(219)

Sample Problem

Configuration: (4) AIM-7, (4) AIM-9, and ℄ pylon

A. Desired altitude	35,000 Ft
B. Mach number	1.6
C. Fuel Flow	1120 PPM

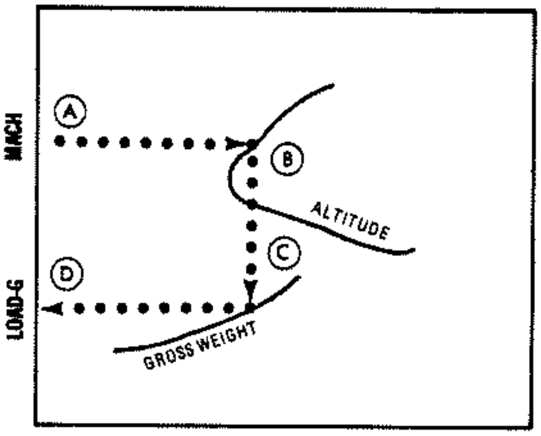
OVERLOAD WARNING SYSTEM SYMMETRICAL ALLOWABLE LOAD FACTOR CHARTS

These charts (Figures A9-8 and A9-9) present the overload warning system symmetrical allowable load factor capability for various Mach numbers, altitudes, and airplane gross weights. Figure A9-8 is used for non-CFT configurations. Figure A9-9 is used in conjunction with Figure A9-8 for CFT configurations.

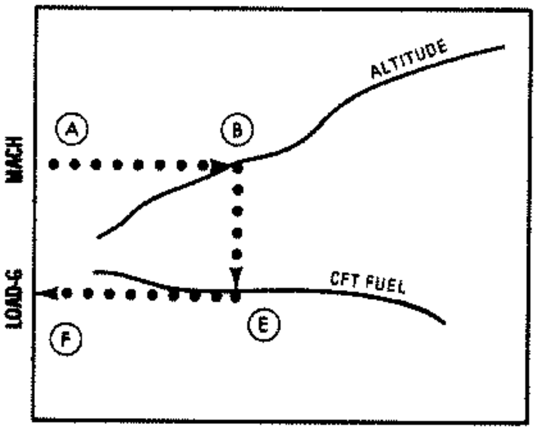
USE

Enter the chart (Figure A9-8) with the desired Mach number and project horizontally to the desired altitude. From this point, descend vertically to the applicable gross weight then project horizontally left to read the airplane symmetrical allowable load factor given by OWS. When CFT's are installed, enter the CFT/Airplane interface chart (Figure A9-9) with the desired Mach number and project horizontally to the desired altitude. From this point, descend vertically to the applicable CFT fuel quantity, then project horizontally left to read the CFT/airplane symmetrical allowable load factor. The combined allowable load factor is the less of the two (airplane and CFT/airplane interface).

SAMPLE OVERLOAD WARNING SYSTEM SYMMETRICAL ALLOWABLE LOAD FACTORS



WITHOUT CFT'S



CFT/AIRPLANE INTERFACE

15A-1-(225)

Sample Problem

Configuration: Full CFTS

A. Mach number	0.8
B. Altitude	Sea Level
C. Gross Weight	45,000 Lb
D. Airplane Symmetrical Load Factor	8.6 g
E. CFT fuel/CFT	4875 Lb
F. CFT/Airplane interface symmetrical allowable load factor	8.0 g
G. Combined Symmetrical allowable load factor	8.0 g

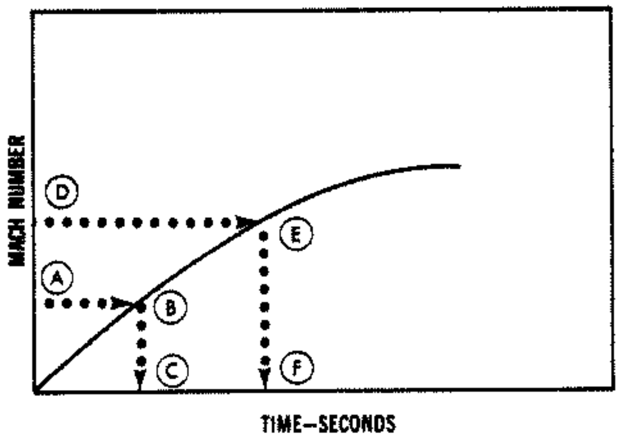
LEVEL FLIGHT ACCELERATION CHARTS

These charts (figures A9-10 thru A9-30) are used to determine time to accelerate in level flight between two Mach numbers. The curves are presented for various configurations with initial gross weights at three engine trim settings. Each chart shows maximum and military thrust accelerations at 10,000 feet and maximum thrust acceleration at 40,000 feet. The curves are presented for a standard day and standard day ±10°C. The origin for each curve is 250 KCAS and .03g acceleration points are indicated on each curve.

USE

Enter applicable configuration/trim setting chart with initial Mach number and altitude, and project horizontally to appropriate thrust/standard day curve. Project vertically down to initial Mach time reference. Enter chart again with final Mach number, project horizontally to the same curve, and project vertically down to the final Mach time reference. To determine time to accelerate, subtract initial Mach number time reference from final Mach number time reference.

SAMPLE LEVEL FLIGHT ACCELERATION



15A-1-(237)

Sample Problem

Configuration: (4) AIM-7, (4) AIM-9 and ℄ Pylon; 42,000 Pounds Initial Gross Weight; 97.7% Engine; Maximum Thrust; Altitude 10,000 Feet

A. Initial Mach number	0.8 Mach
B. Maximum thrust/ standard day curve	STD −10°C
C. Initial Mach number time reference	15 Seconds
D. Final Mach number	1.2 Mach
E. Maximum thrust/ standard day curve	STD −10°C
F. Final Mach number time reference	60 seconds
G. Time to accelerate (F. minus C.)	45 seconds

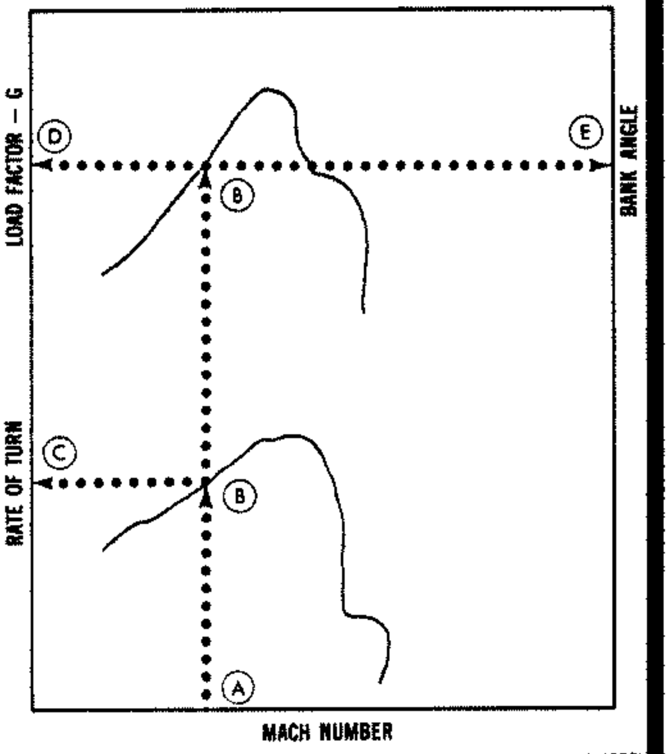
SUSTAINED LEVEL TURNS

These charts (figure A9-31 thru A9-37) present the maximum sustained level rate of turn and corresponding maximum sustained load factor for a given Mach number and altitude. The charts are based on maximum thrust with 97.7% engine trim for various aircraft configurations. Bank angles are shown for corresponding load factors, and a formula is provided to calculate radius of turn.

USE

Enter chart with Mach number and project vertically up to applicable rate of turn and load factor altitude curves. Project horizontally left from rate of turn altitude curve to maximum sustained rate of turn. Project horizontally left from load factor altitude curve to the maximum sustained load factor corresponding to the maximum sustainable turn rate. Project horizontally right from the load factor altitude curve to bank angle corresponding to the maximum sustained load factor.

SAMPLE SUSTAINED LEVEL TURNS



15A-1-(238)

Sample Problem

Configuration: (4) AIM-7, (4) AIM-9, and ℄ Pylon; 39,000 Pounds Gross Weight

A. Mach number	0.8 Mach
B. Altitude	40,000 FT
C. Maximum sustained turn rate	3.8°/SEC
D. Maximum sustained load factor	1.9g
E. Bank angle	58.2°
F. Radius of turn	1.92NM

LEVEL FLIGHT ENVELOPE

GROSS WEIGHT - 35,000 POUNDS

AIRPLANE CONFIGURATION
F-15A/C
CLEAN

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

REMARKS

ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966

NOTE

CAPABILITY REMAINING: MAXIMUM SPEEDS, ACCELERATION OF 0 AND .03G; CEILINGS AND LOW SPEED, RATE OF CLIMB OF 500 FEET PER MINUTE.

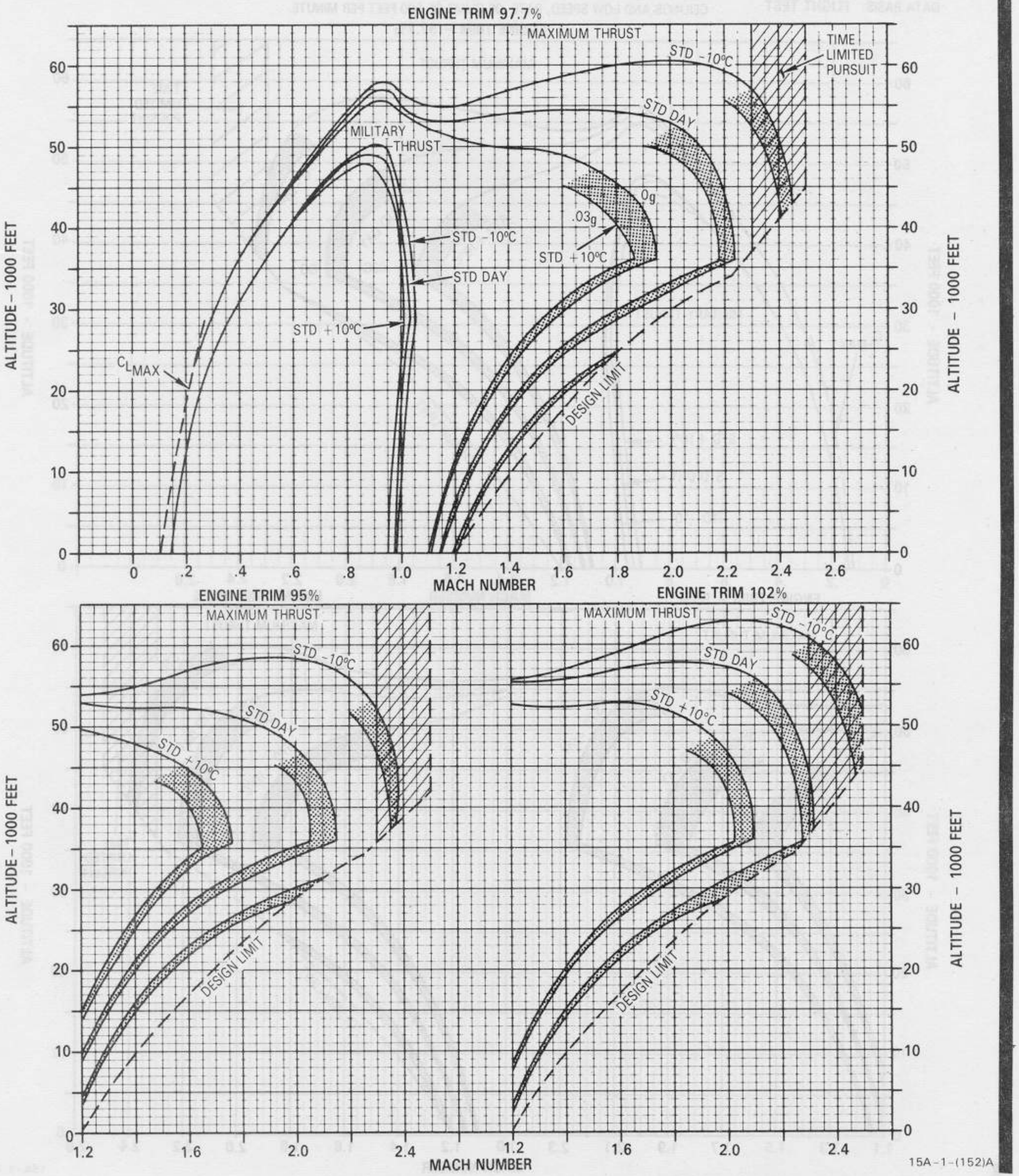


Figure A9-1

LEVEL FLIGHT ENVELOPE

GROSS WEIGHT - 36,000 POUNDS

AIRPLANE CONFIGURATION

F-15A/C
(3) PYLONS + (4) LAUNCHERS/ADAPTERS

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

REMARKS

ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966

NOTE

CAPABILITY REMAINING: MAXIMUM SPEEDS, ACCELERATION OF 0 AND .03G; CEILINGS AND LOW SPEED, RATE OF CLIMB OF 500 FEET PER MINUTE.

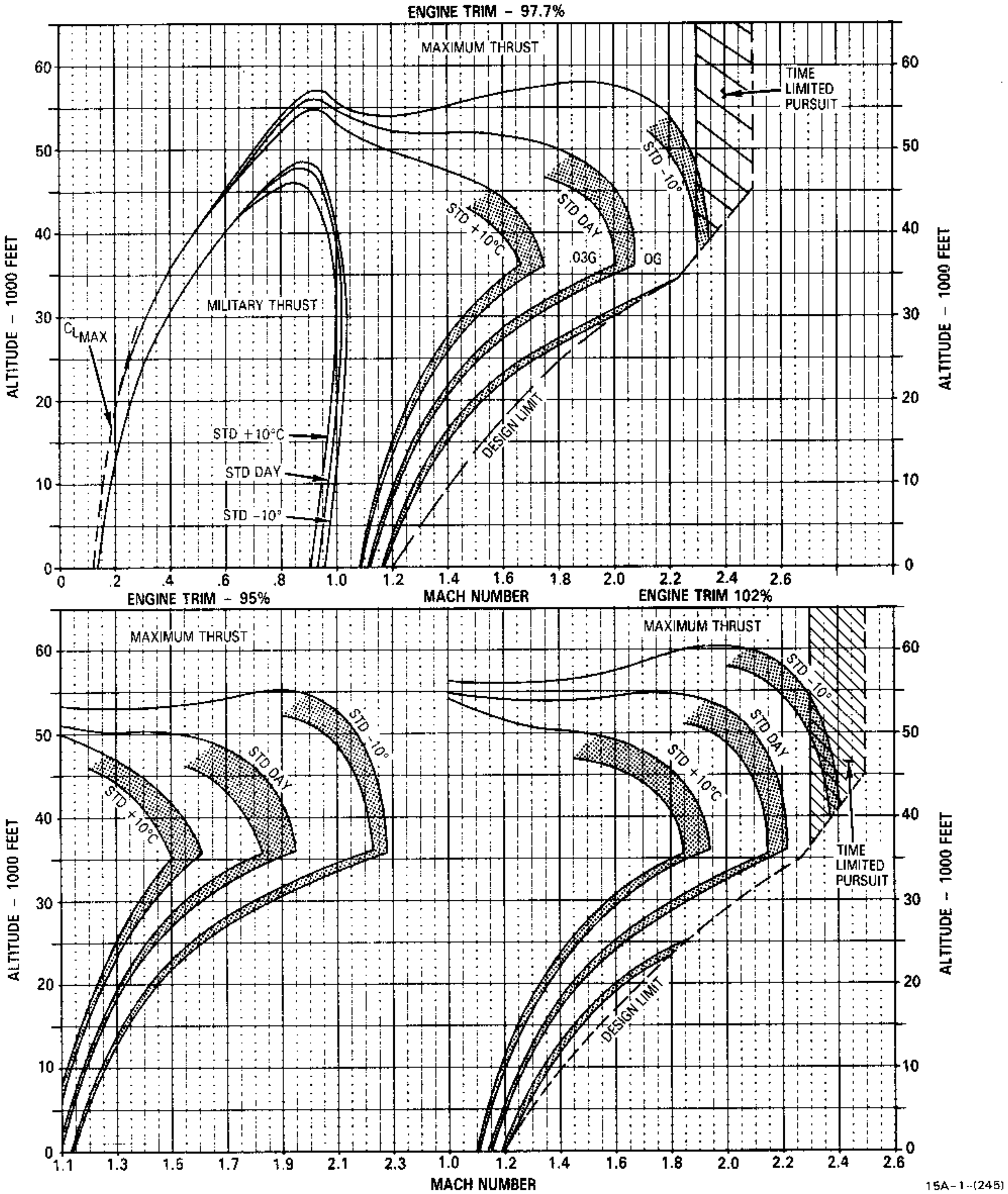


Figure A9-1A

LEVEL FLIGHT ENVELOPE

GROSS WEIGHT - 39,000 POUNDS

AIRPLANE CONFIGURATION
F-15A/C
(4)AIM-7+(4)AIM-9+℄ PYLON

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

REMARKS
ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966

NOTE
CAPABILITY REMAINING: MAXIMUM SPEEDS, ACCELERATION OF 0 AND .03G; CEILINGS AND LOW SPEED, RATE OF CLIMB OF 500 FEET PER MINUTE.

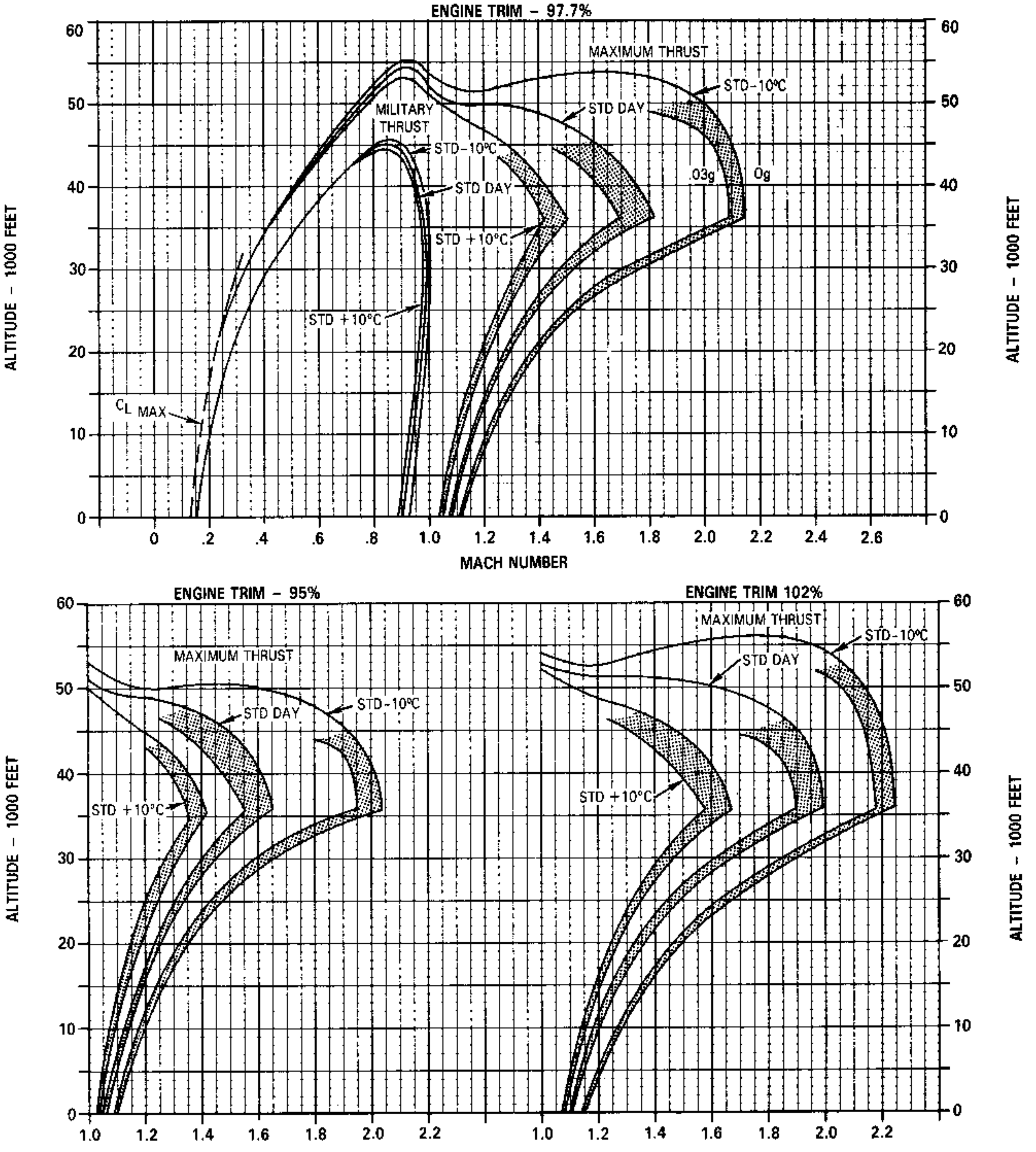


Figure A9-1B

LEVEL FLIGHT ENVELOPE

GROSS WEIGHT - 39,000 POUNDS

AIRPLANE CONFIGURATION

F-15A/C
℄ TANK + (2) WING PYLONS
+ (4) LAUNCHERS/ADAPTERS + (4) AIM-9

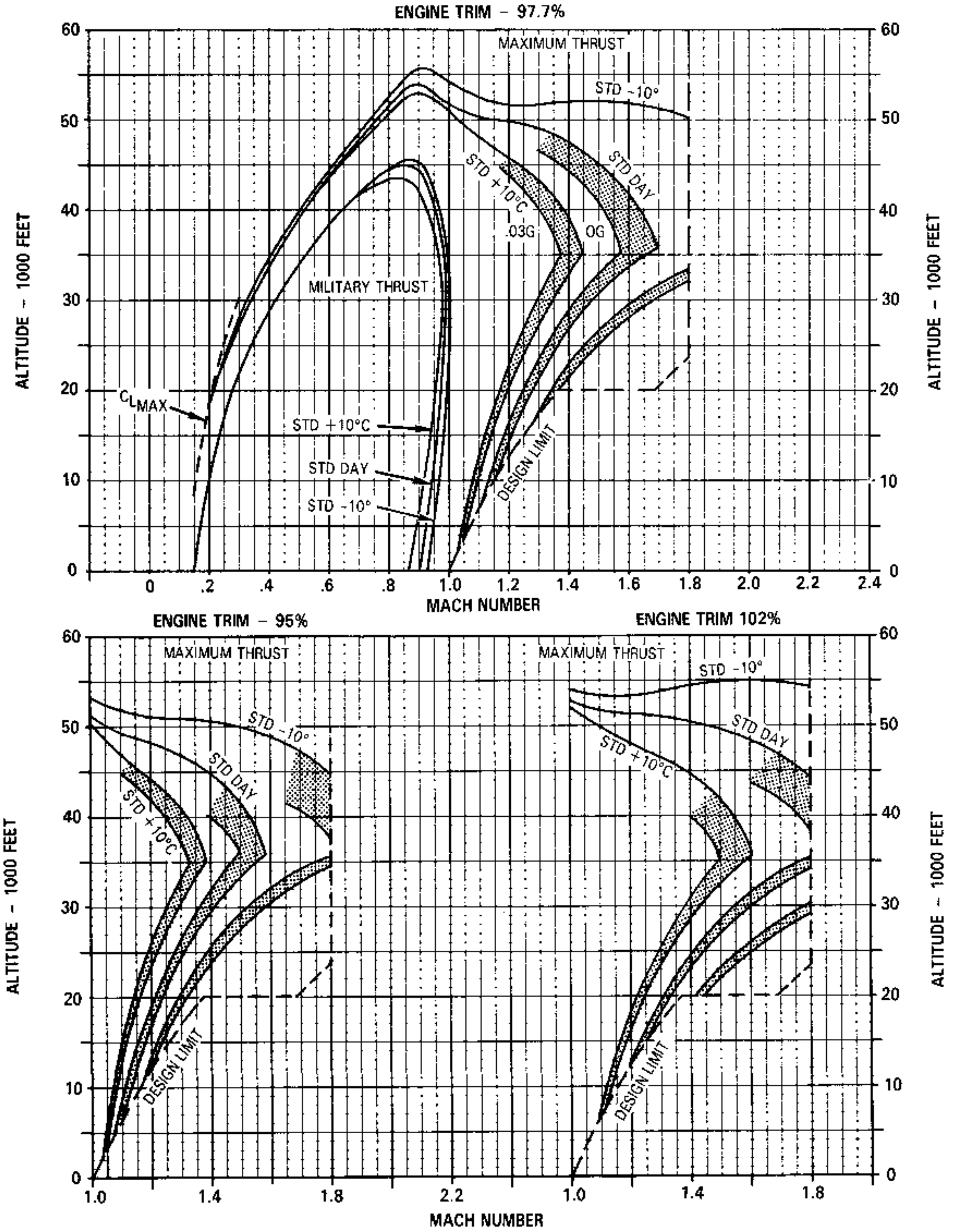
DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

REMARKS

ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966

NOTE

CAPABILITY REMAINING: MAXIMUM SPEEDS, ACCELERATION OF 0 AND .03G; CEILINGS AND LOW SPEED, RATE OF CLIMB OF 500 FEET PER MINUTE.



15A-1-(247)

Figure A9-1C

LEVEL FLIGHT ENVELOPE

GROSS WEIGHT - 41,000 POUNDS

AIRPLANE CONFIGURATION
F-15A/C
(4)AIM-7 + (4)AIM-9 + ℄ TANK

REMARKS

ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

NOTE

CAPABILITY REMAINING: MAXIMUM SPEEDS, ACCELERATION OF 0 AND .03G; CEILINGS AND LOW SPEED, RATE OF CLIMB OF 500 FEET PER MINUTE.

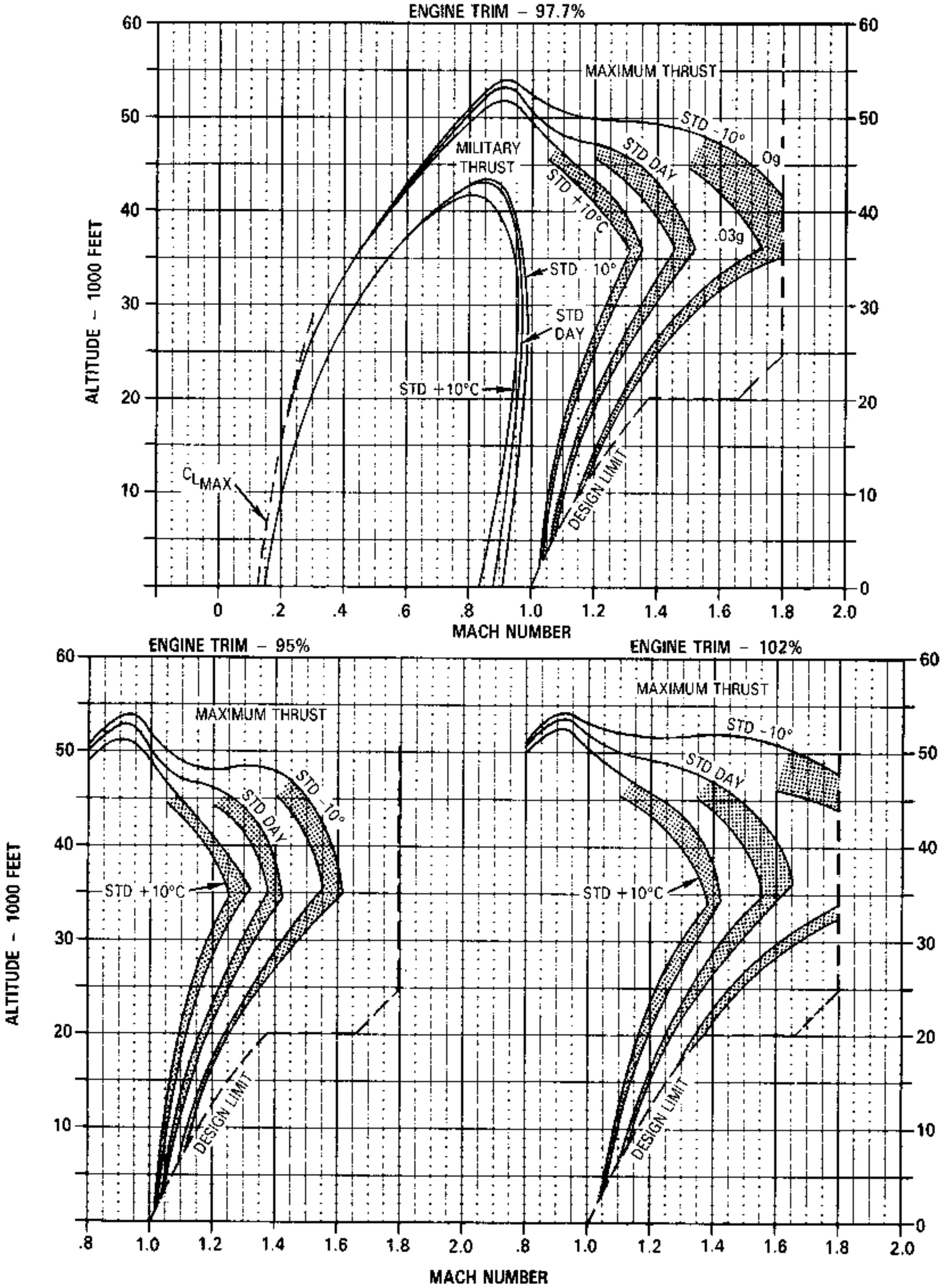


Figure A9-1D

LEVEL FLIGHT ENVELOPE

GROSS WEIGHT - 42,000 POUNDS

AIRPLANE CONFIGURATION
F-15A/C
CFT

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

REMARKS
ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966

NOTE
CAPABILITY REMAINING: MAXIMUM SPEEDS, ACCELERATION OF 0 AND .03G; CEILINGS AND LOW SPEED, RATE OF CLIMB OF 500 FEET PER MINUTE.

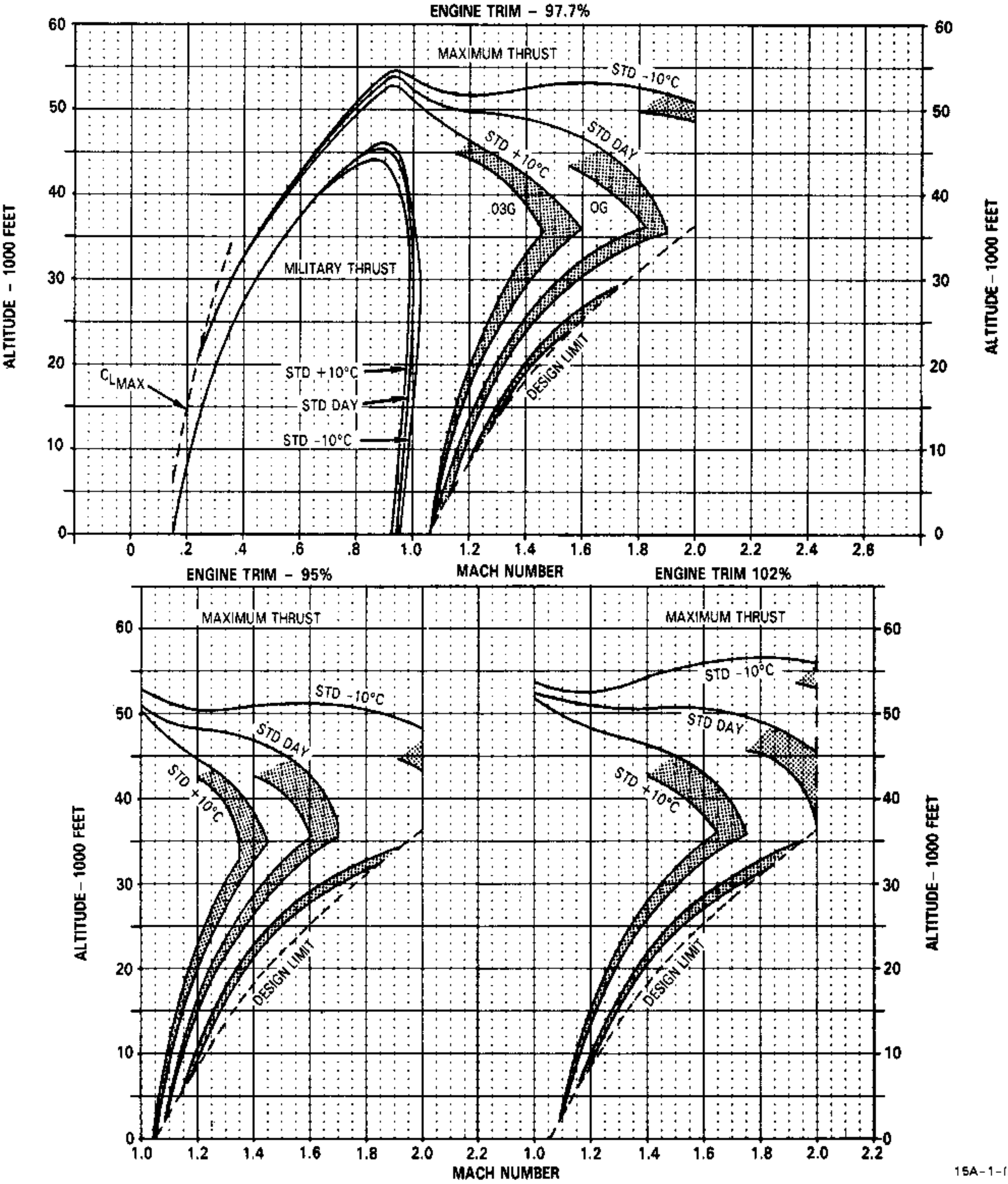


Figure A9-1E

LEVEL FLIGHT ENVELOPE

GROSS WEIGHT — 46,000 POUNDS

AIRPLANE CONFIGURATION
F-15C
CFT
(4)AIM-7+(4)AIM-9 + ℄ PYLON

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

REMARKS

ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966

NOTE

CAPABILITY REMAINING: MAXIMUM SPEEDS, ACCELERATION OF 0 AND .03G; CEILINGS AND LOW SPEED, RATE OF CLIMB OF 500 FEET PER MINUTE.

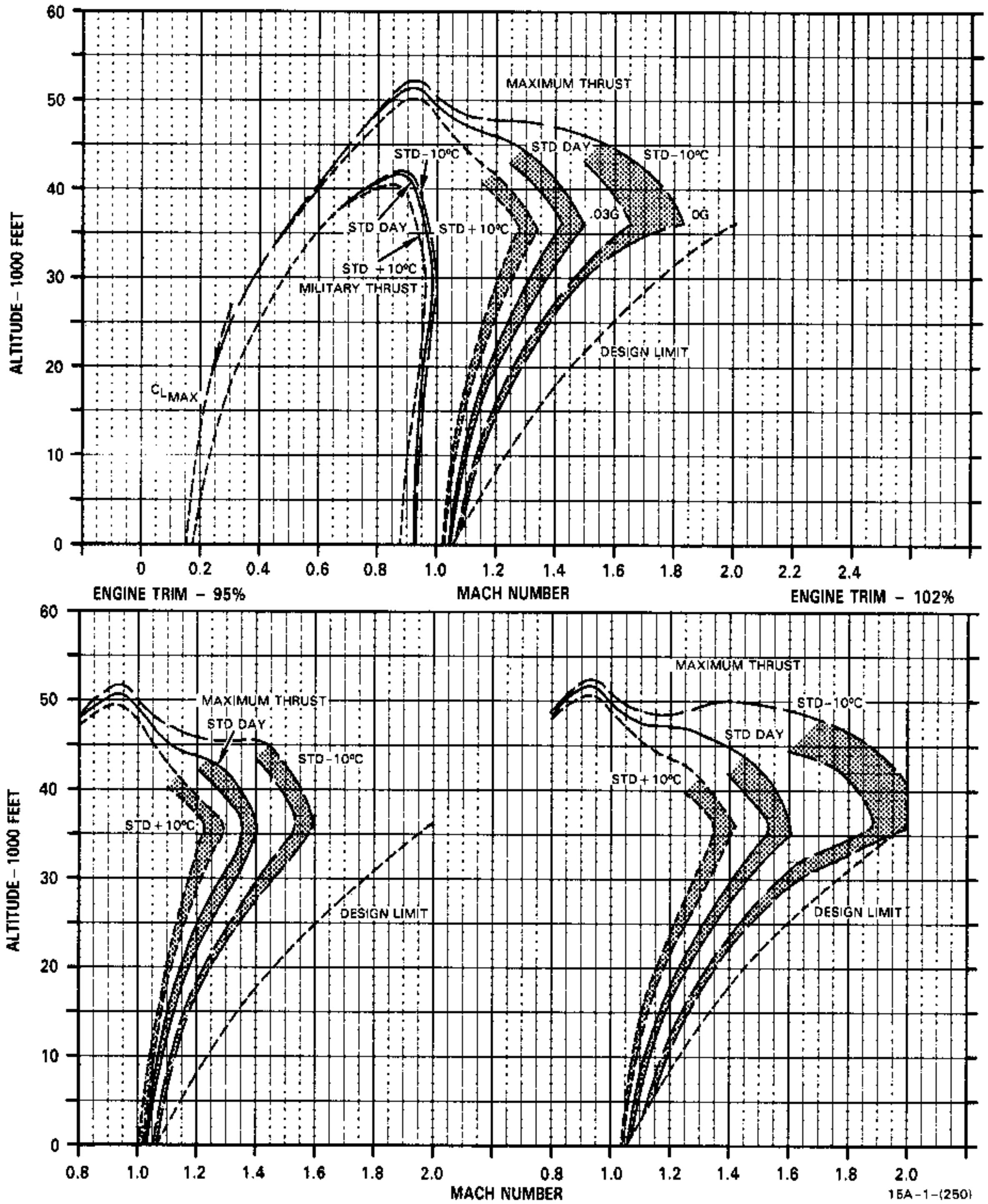


Figure A9-1F

LEVEL FLIGHT ENVELOPE

GROSS WEIGHT — 37,000 POUNDS

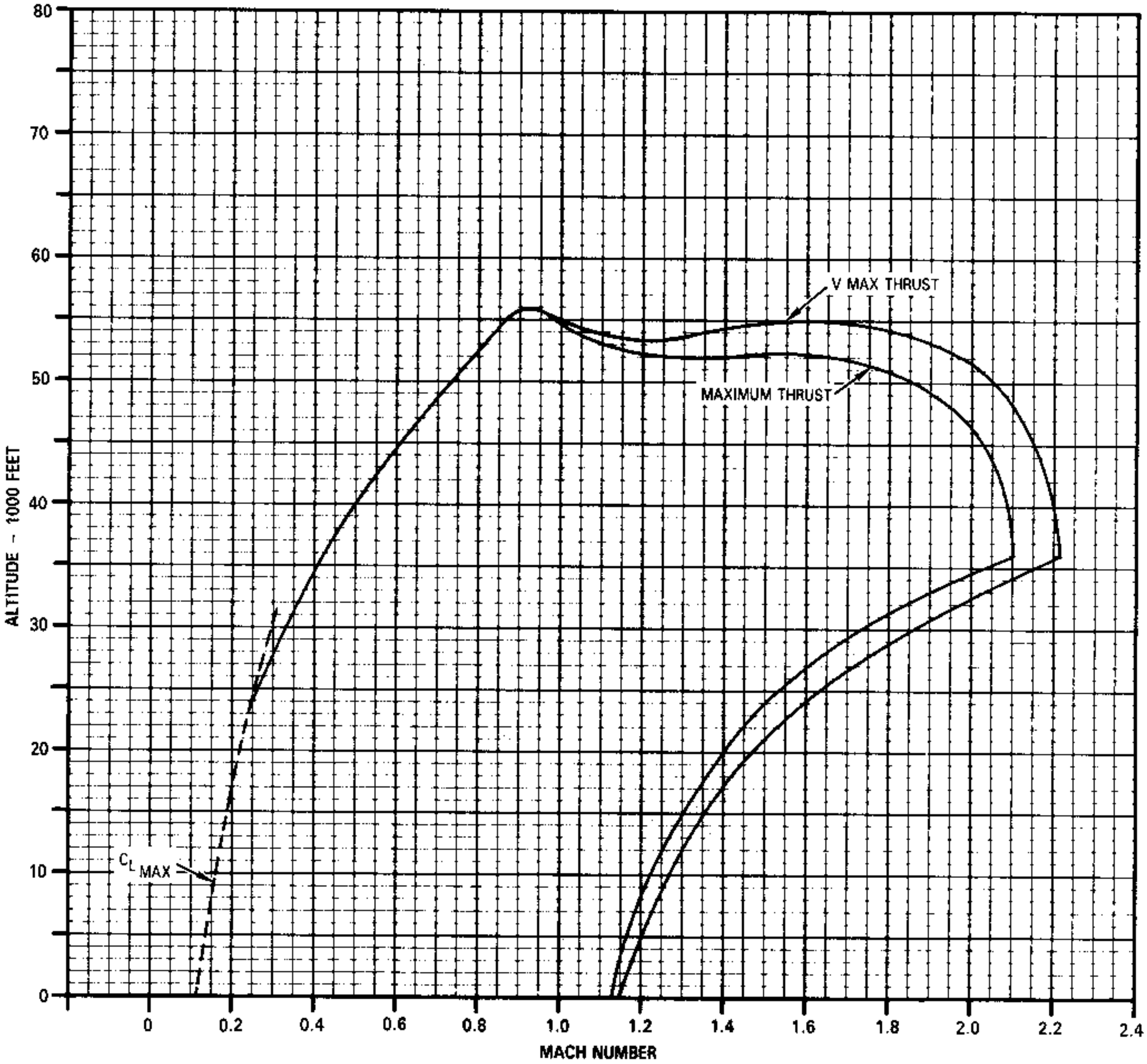
AIRPLANE CONFIGURATION
F-15A/C
(4) AIM-7F

REMARKS
ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966
ENGINE TRIM - 97.7%

DATA: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

NOTE

- CAPABILITIES REMAINING:
  CEILINGS AND LOW AIR SPEED,
  RATE OF CLIMB OF 500 FEET
  PER MINUTE.
- MAXIMUM SPEED-0G ACCELERATION



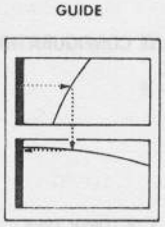
15A-1-(251)

Figure A9-1G

DIVE RECOVERY - 6.0G PULL-OUT

SUBSONIC - SPEED BRAKE RETRACTED

GROSS WEIGHT - 37,400 POUNDS



AIRPLANE CONFIGURATION

(2) WING PYLONS +
(4) AIM-9 LAUNCHERS +
℄ 610 GAL FUEL TANK (ON OR OFF)

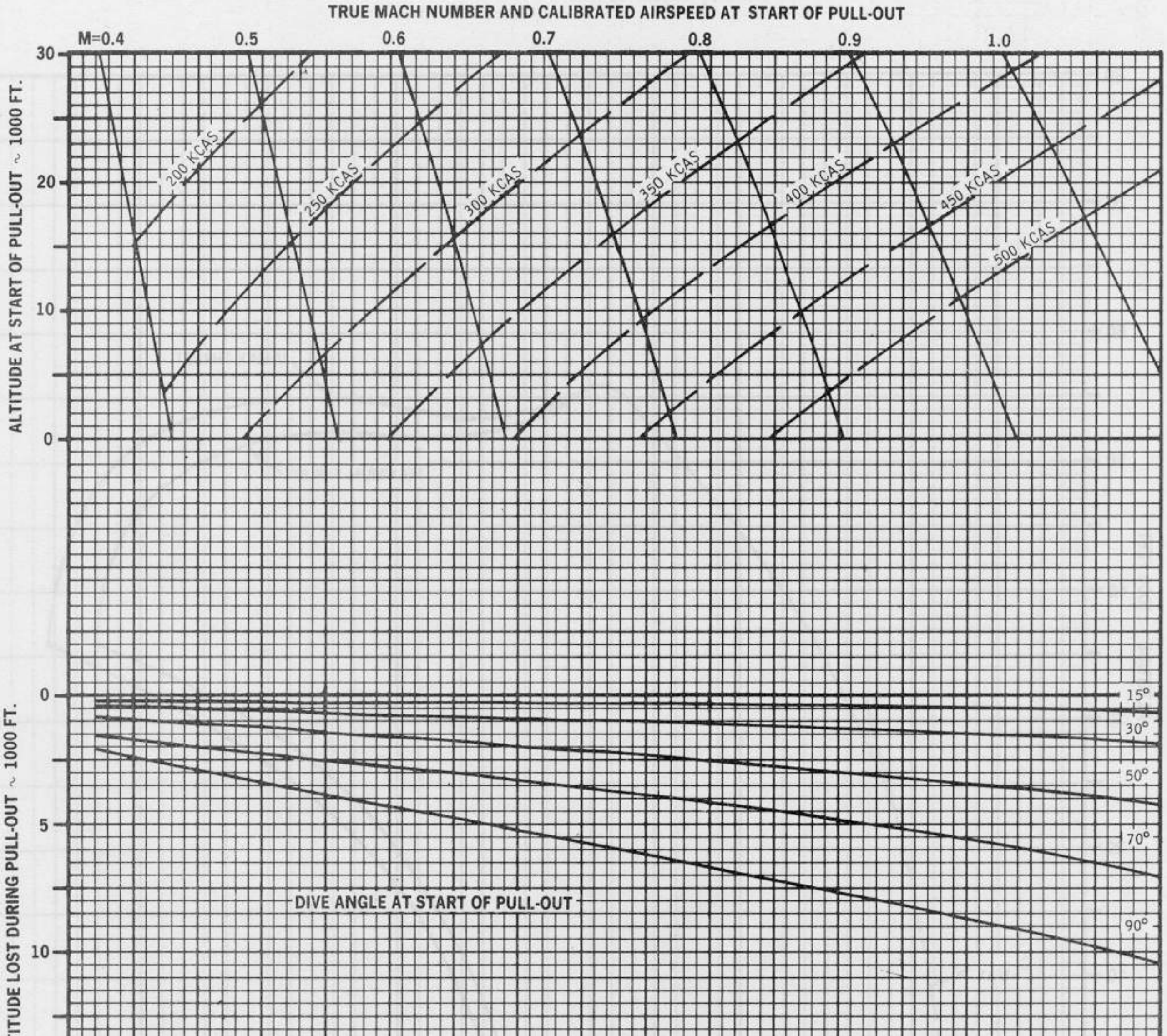
DATE: 15 JANUARY 1983
DATA BASIS: **FLIGHT TEST**

REMARKS

ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966

NOTES

1. ALTITUDE LOSS WITH MAXIMUM THRUST IS ESSENTIALLY THE SAME WITH MILITARY THRUST
2. PULL-OUT BASED ON 2.0G PER SECOND ACCELERATION BUILDUP TO MAXIMUM USABLE NORMAL FORCE STABILATOR LIMIT OR 6.0G WHICHEVER OCCURS FIRST.



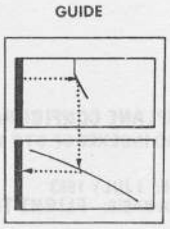
15A–1–(186)A

Figure A9-2

DIVE RECOVERY - 6.0G PULL-OUT

SUPERSONIC - SPEED BRAKE RETRACTED

GROSS WEIGHT - 37,400 POUNDS



AIRPLANE CONFIGURATION

(2) WING PYLONS +
(4) AIM-9 LAUNCHERS +
℄ 610 GAL FUEL TANK (ON OR OFF)

REMARKS

ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966

NOTES

1. ALTITUDE LOSS WITH MAXIMUM THRUST IS ESSENTIALLY THE SAME WITH MILITARY THRUST
2. PULL-OUT BASED ON 2.0G PER SECOND ACCELERATION BUILDUP TO MAXIMUM USABLE NORMAL FORCE STABILATOR LIMIT OR 6.0G WHICHEVER OCCURS FIRST.

DATE: 15 JANUARY 1983
DATA BASIS: **FLIGHT TEST**

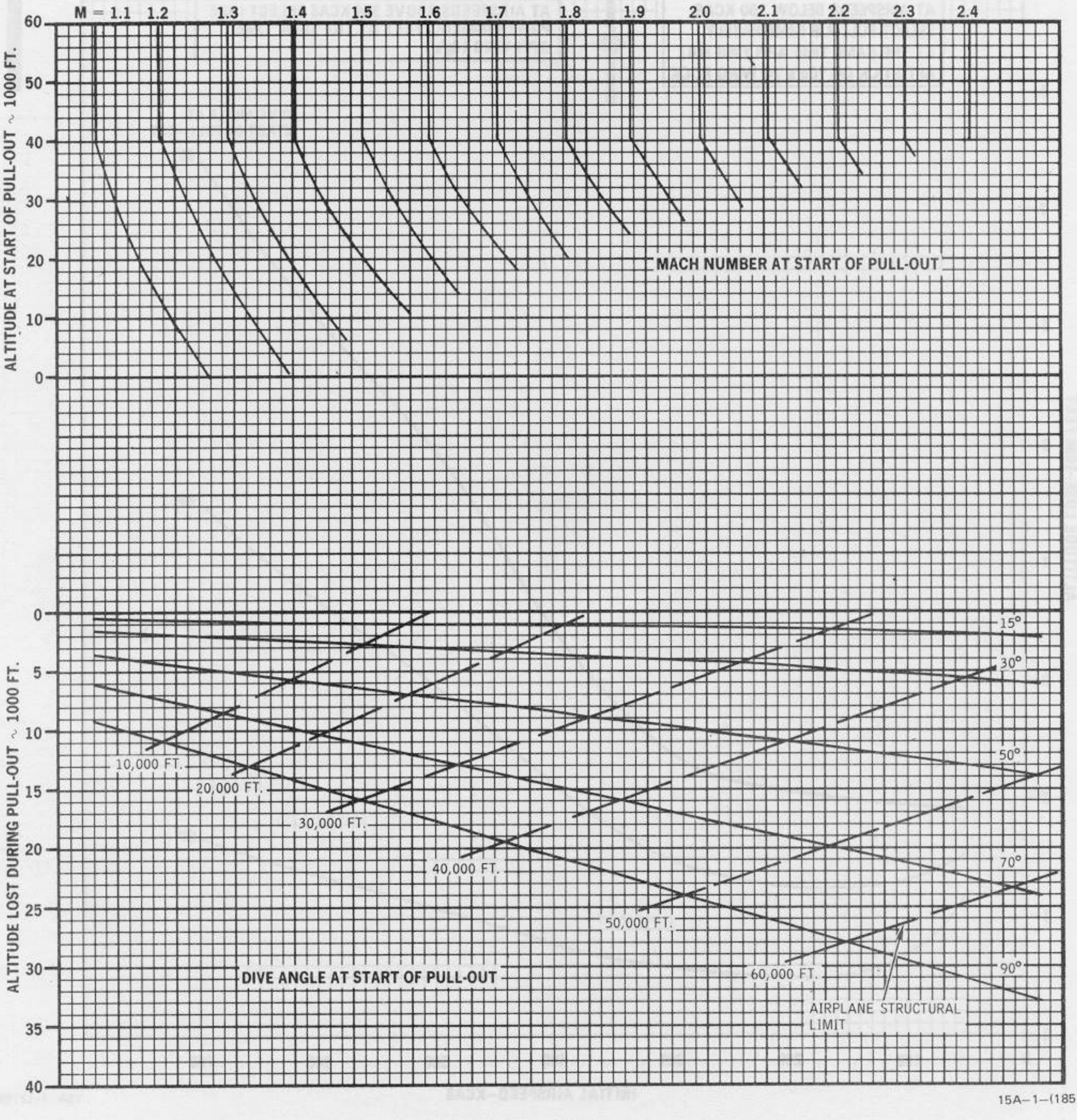
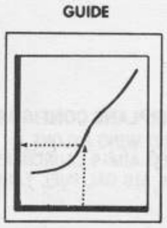


Figure A9-3

DIVE RECOVERY - EMERGENCY PULL-OUT

GROSS WEIGHTS OF 34,000 TO 38,000 POUNDS APPLICABLE TO LOW ALTITUDES



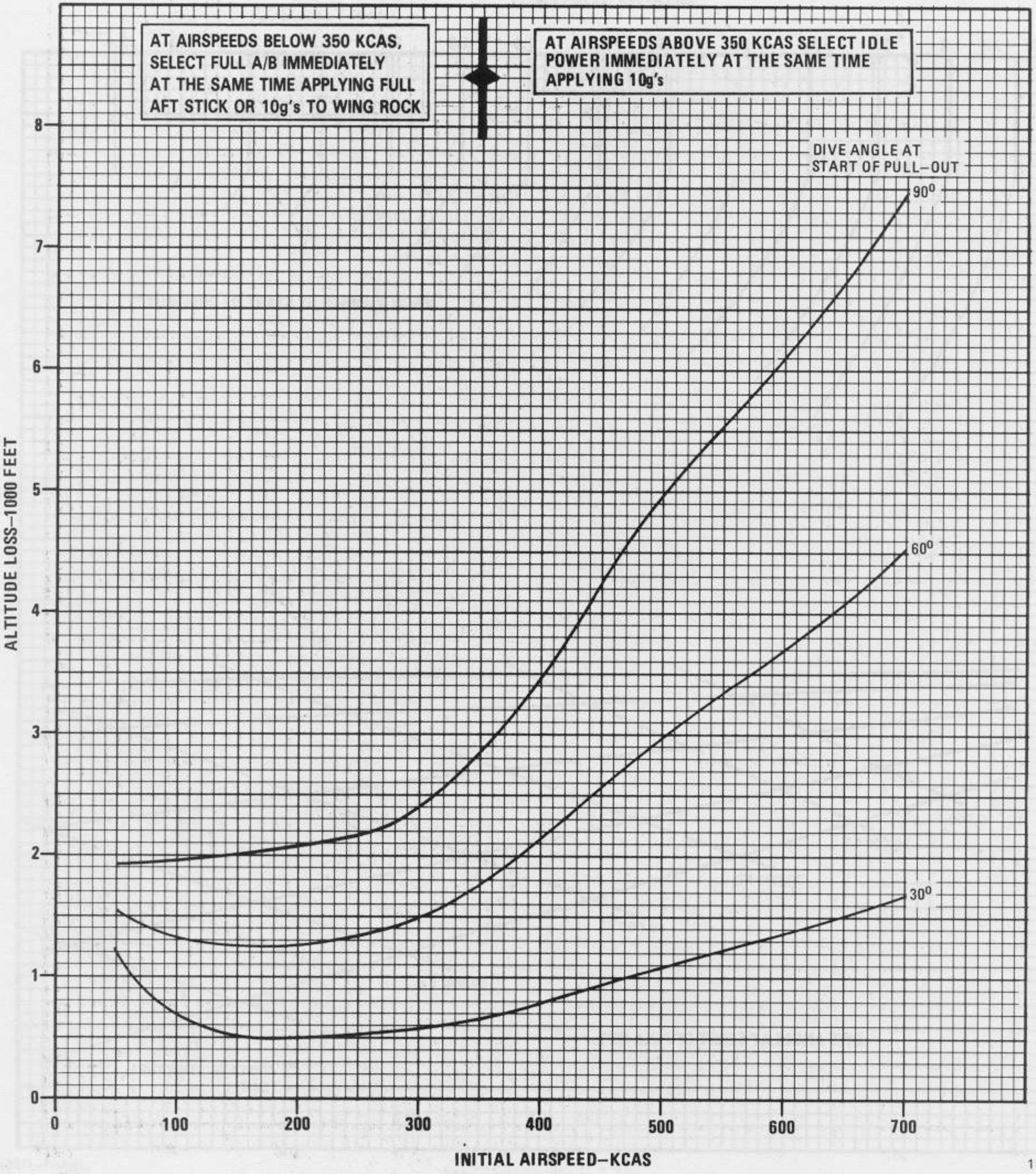
AIRPLANE CONFIGURATION
DRAG INDEXES OF 0 TO 40

DATE: 1 JULY 1983
DATA BASIS: **FLIGHT TEST**

REMARKS
ENGINES: (2) F100–PW–100
U.S. STANDARD DAY, 1966

NOTES

1. RETRACT SPEEDBRAKE AT AIRSPEEDS BELOW 350 KCAS, EXTEND ABOVE 350 KCAS.
2. CAS ON OR OFF



15A–1–(216)D

Figure A9-4

DIVE RECOVERY - EMERGENCY PULL-OUT

GROSS WEIGHTS OF 50,000 TO 54,000 POUNDS
APPLICABLE TO LOW ALTITUDES

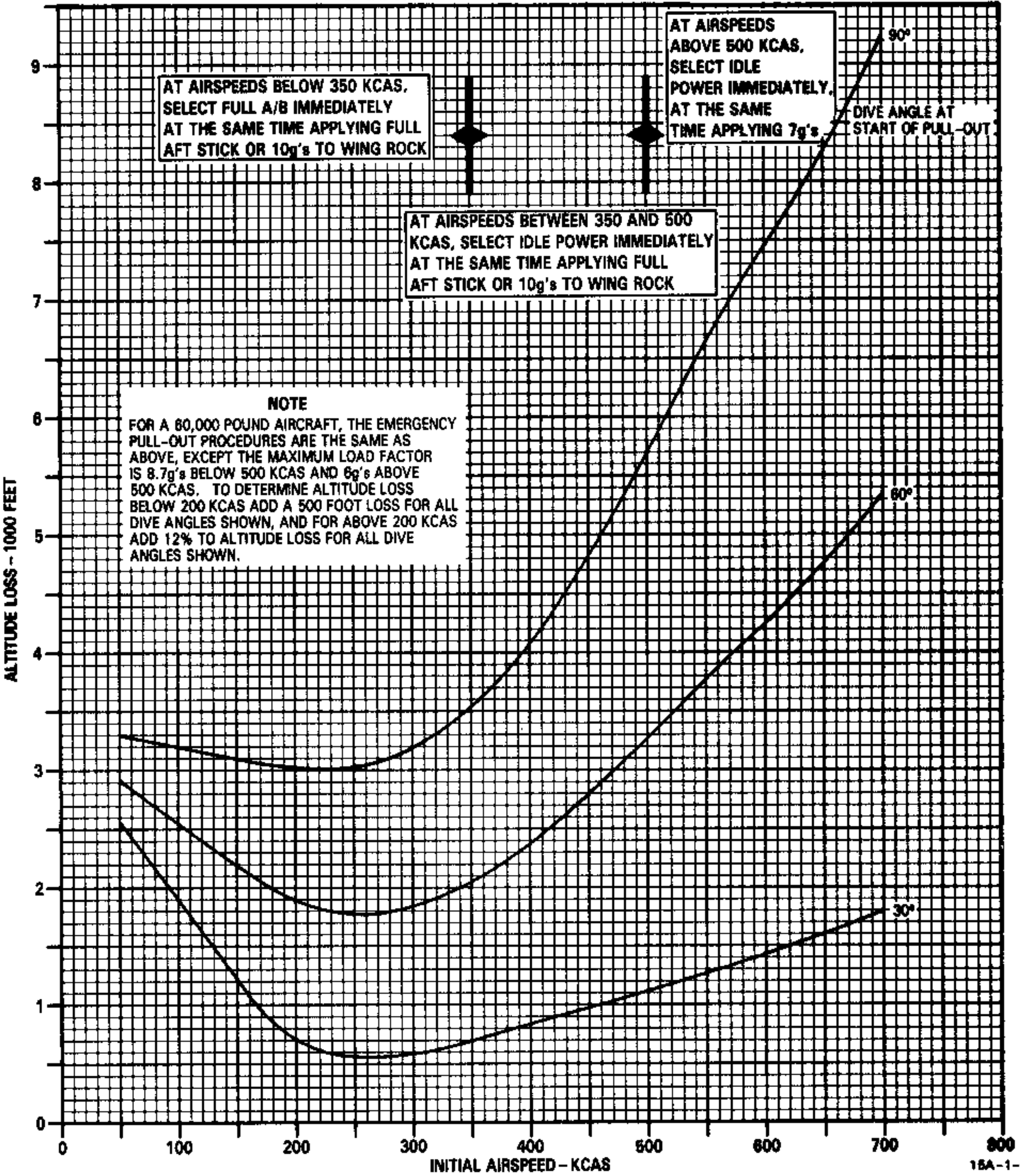
AIRPLANE CONFIGURATION
CFT
DRAG INDEXES OF 0 TO 40

DATE: 1 MARCH 1986
DATA BASIS: **FLIGHT TEST**

REMARKS
ENGINES: (2) F100–PW–100
U.S. STANDARD DAY, 1966

NOTES

1. RETRACT SPEEDBRAKE AT AIRSPEEDS BELOW 350 KCAS, EXTEND ABOVE 350 KCAS.
2. CAS ON.



AT AIRSPEEDS BELOW 350 KCAS, SELECT FULL A/B IMMEDIATELY AT THE SAME TIME APPLYING FULL AFT STICK OR 10g's TO WING ROCK

AT AIRSPEEDS BETWEEN 350 AND 500 KCAS, SELECT IDLE POWER IMMEDIATELY AT THE SAME TIME APPLYING FULL AFT STICK OR 10g's TO WING ROCK

AT AIRSPEEDS ABOVE 500 KCAS, SELECT IDLE POWER IMMEDIATELY, AT THE SAME TIME APPLYING 7g's.

NOTE

FOR A 60,000 POUND AIRCRAFT, THE EMERGENCY PULL-OUT PROCEDURES ARE THE SAME AS ABOVE, EXCEPT THE MAXIMUM LOAD FACTOR IS 8.7g's BELOW 500 KCAS AND 6g's ABOVE 500 KCAS. TO DETERMINE ALTITUDE LOSS BELOW 200 KCAS ADD A 500 FOOT LOSS FOR ALL DIVE ANGLES SHOWN, AND FOR ABOVE 200 KCAS ADD 12% TO ALTITUDE LOSS FOR ALL DIVE ANGLES SHOWN.

Figure A9-4A.

LOW ALTITUDE COMBAT PERFORMANCE

MAXIMUM THRUST

AIRPLANE CONFIGURATION
ALL DRAG INDEXES

REMARKS
ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966
ENGINE TRIM: 97.7%

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

	CONSTANT KCAS	SPECIFIC FUEL FLOW – LB/MIN	TEMPERATURE EFFECTS	
			ACTUAL OAT DEG C	CORRECTION FACTOR
SEA LEVEL (15°C)	300	1631	-40	1.19
	400	1764	-20	1.17
	500	1886	0	1.07
	600	2082	20	.98
	700	2227	40	.90
5000 FEET (5.1°C)	300	1453	-40	1.21
	400	1548	-20	1.14
	500	1661	0	1.03
	600	1861	20	.94
	700	2014	40	.86
10,000 FEET (−4.8°C)	300	1377	-40	1.18
	400	1461	-20	1.08
	500	1585	0	.97
	600	1806	20	.88
	700	2001	40	.81

15A-1-(214)B

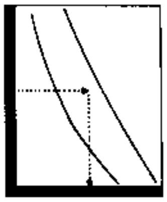
Figure A9-5

COMBAT FUEL MANAGEMENT

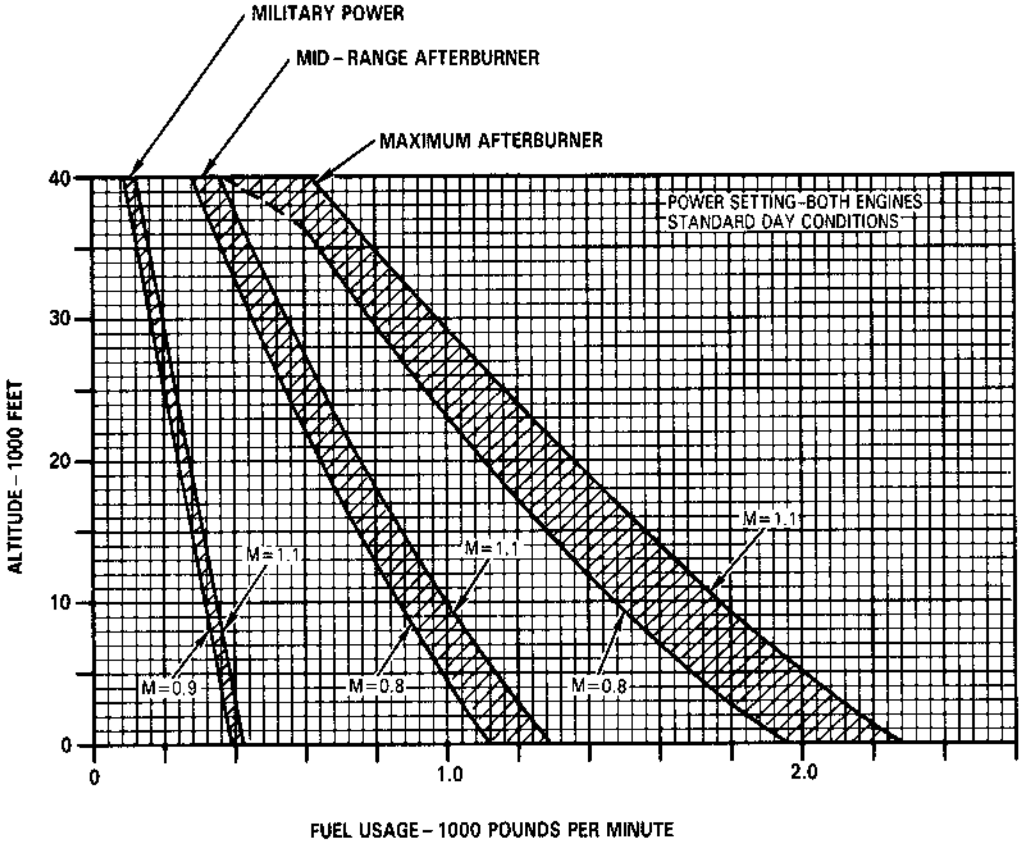
AIRPLANE CONFIGURATION
ALL DRAG INDEXES

REMARKS
ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966
ENGINE TRIM 97.7%

GUIDE



DATE: 1 OCTOBER 1985
DATA-BASIS: **FLIGHT TEST**



15A-1-(218)B

Figure A9-6

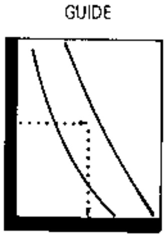
COMBAT FUEL FLOW

STABILIZED LEVEL FLIGHT

AIRPLANE CONFIGURATION
F-15A/C

REMARKS
ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY 1966
ENGINE TRIM: 97.7%

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**



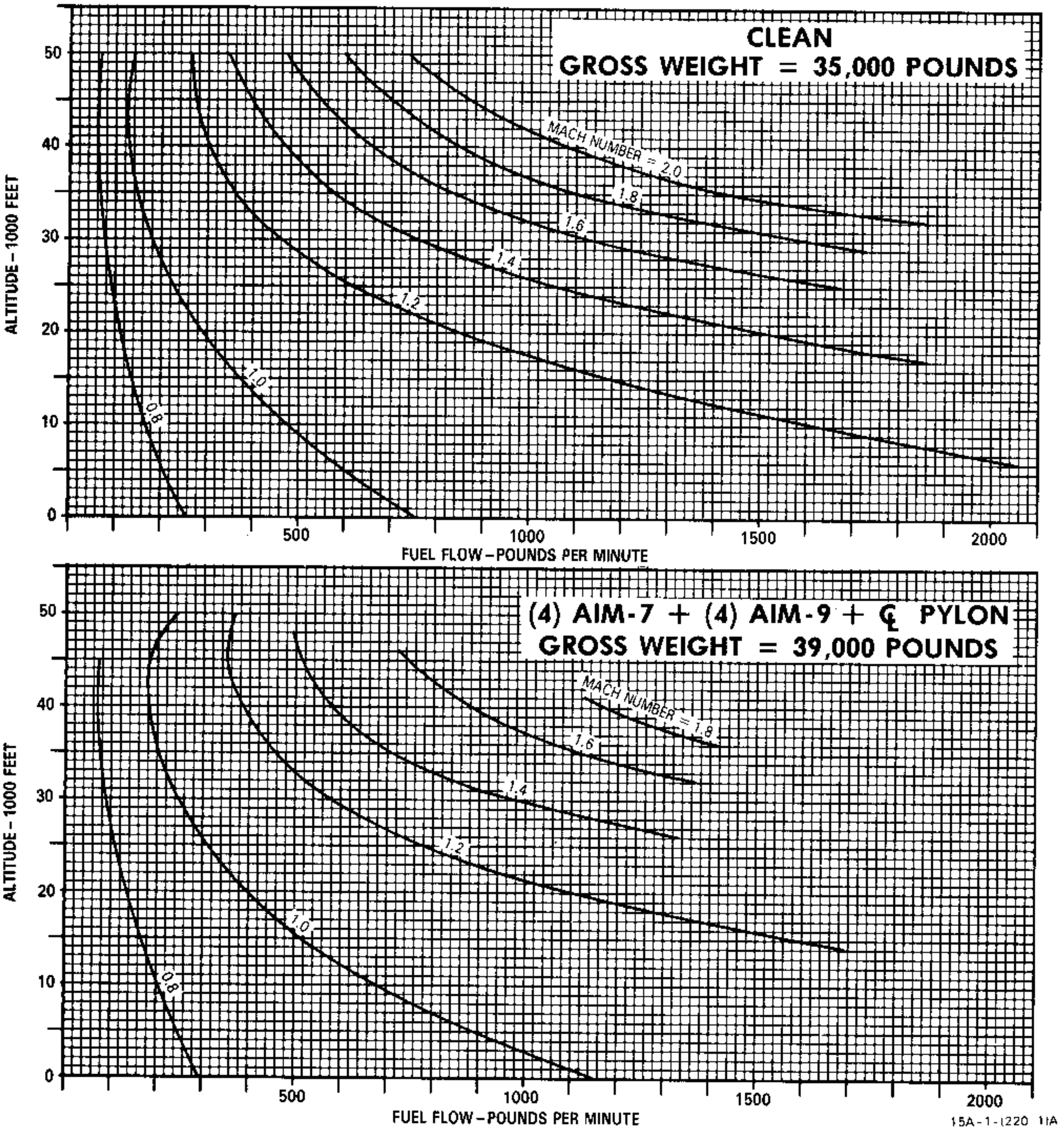


Figure A9-7 (Sheet 1 of 4)

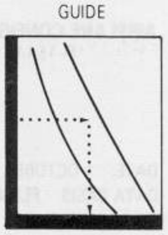
COMBAT FUEL FLOW

STABILIZED LEVEL FLIGHT

AIRPLANE CONFIGURATION
F-15A/C

REMARKS
ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY 1966
ENGINE TRIM: 97.7%

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**



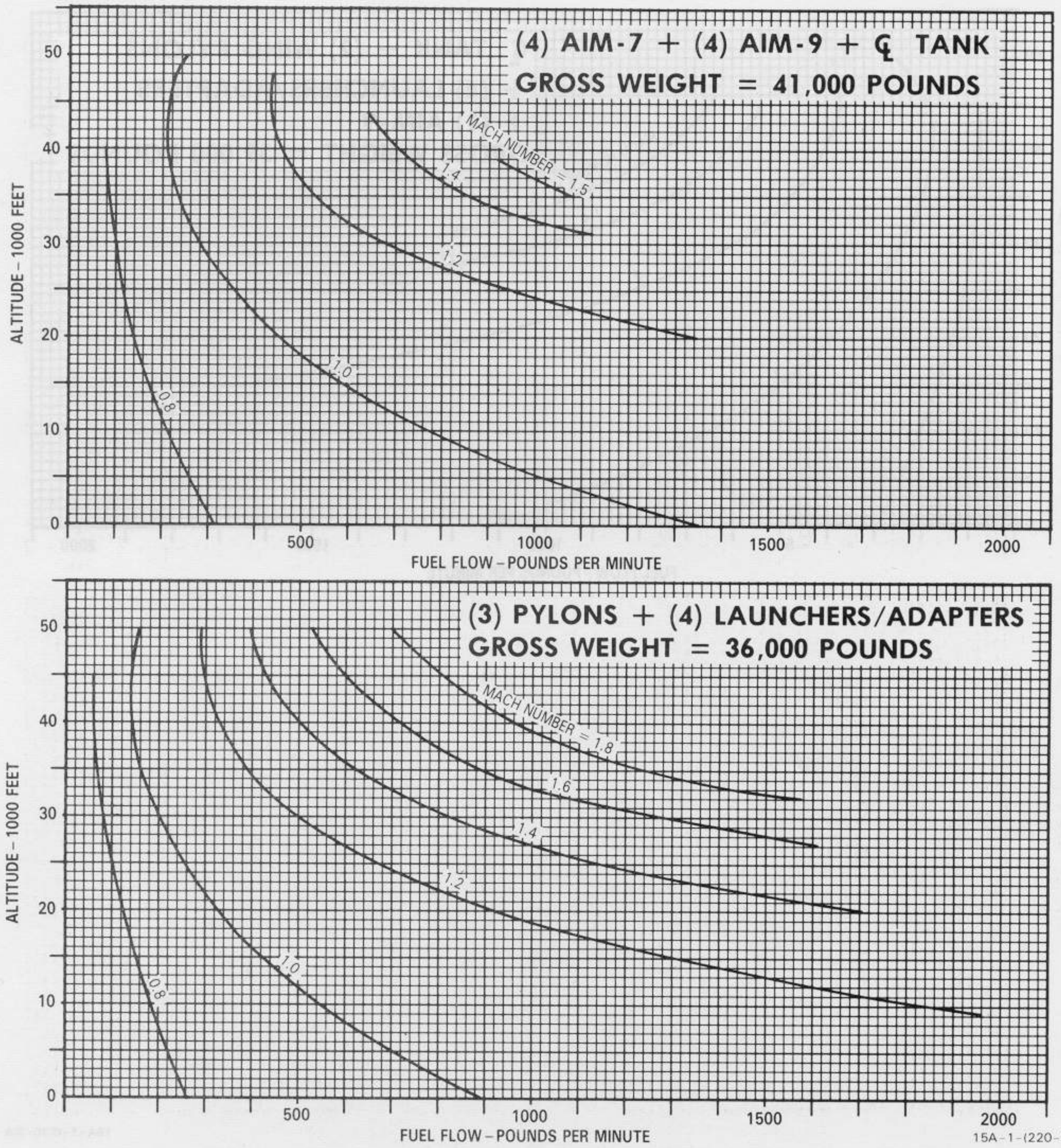


Figure A9-7 (Sheet 2)

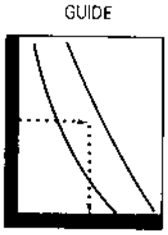
COMBAT FUEL FLOW

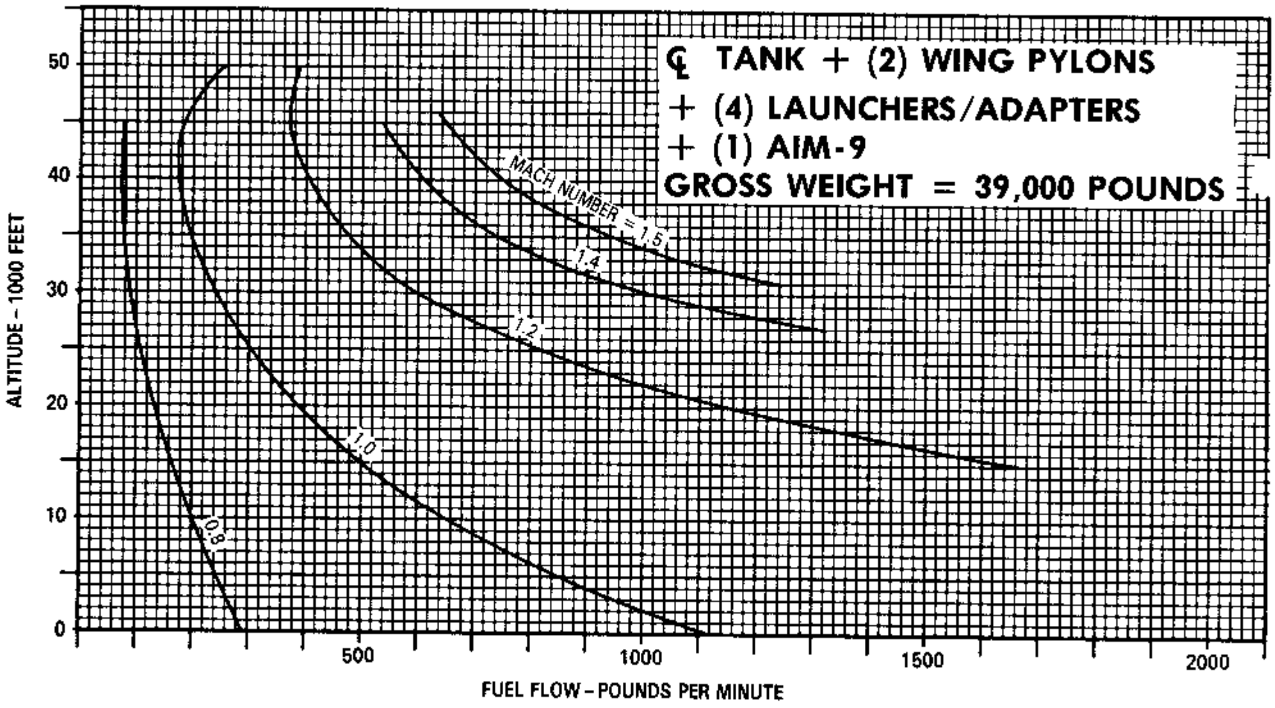
STABILIZED LEVEL FLIGHT

AIRPLANE CONFIGURATION
F-15A/C

REMARKS
ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY 1966
ENGINE TRIM: 97.7%

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**





15A-1-(220-3)A

Figure A9-7 (Sheet 3)

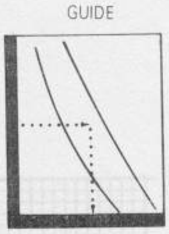
COMBAT FUEL FLOW

STABILIZED LEVEL FLIGHT

AIRPLANE CONFIGURATION
F-15A/C

REMARKS
ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY 1966
ENGINE TRIM: 97.7%

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**



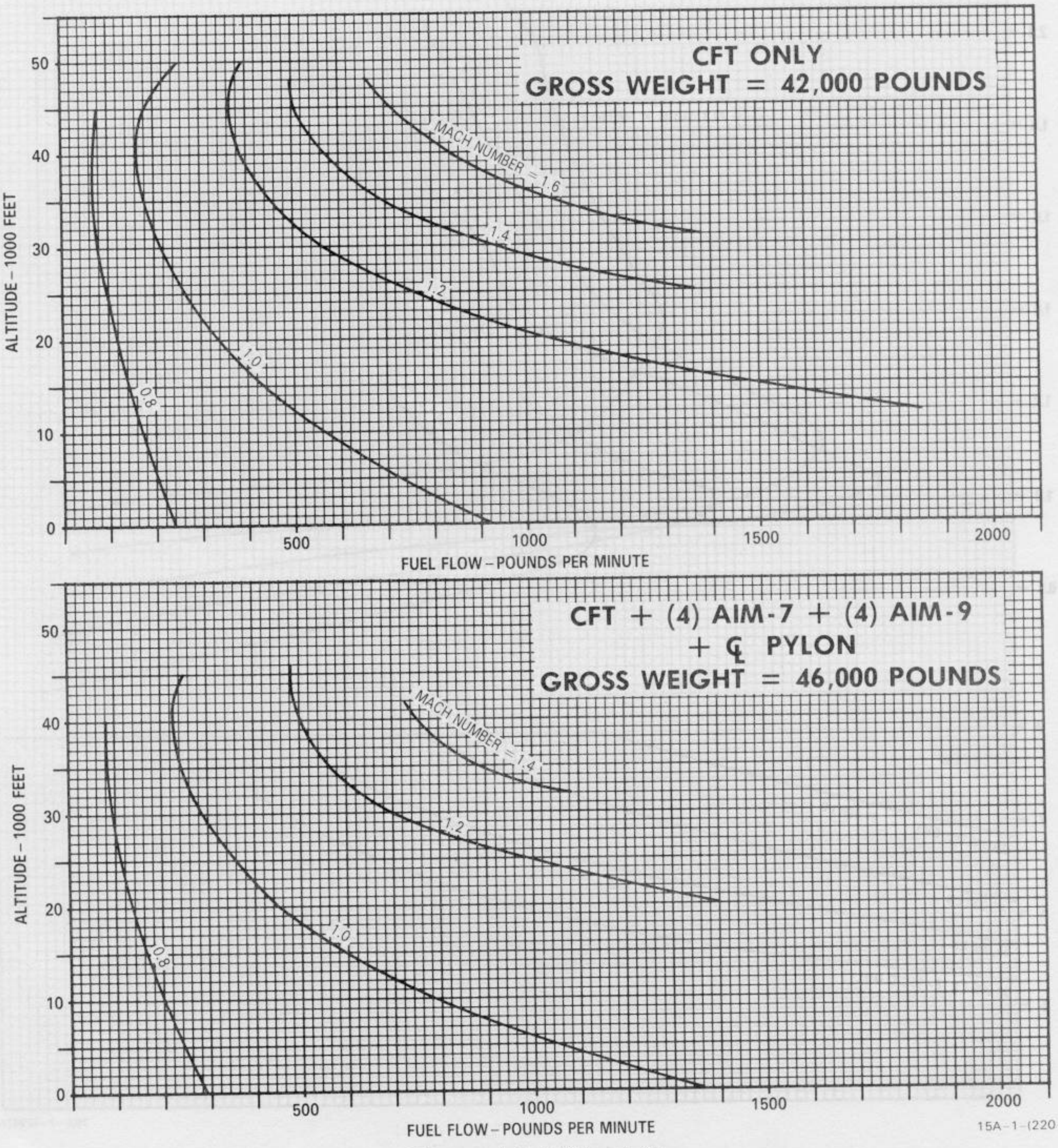
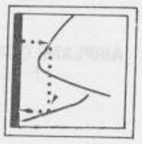


Figure A9-7 (Sheet 4)

OVERLOAD WARNING SYSTEM SYMMETRICAL ALLOWABLE LOAD FACTORS



NOTE

1. SOME EXTERNAL STORE CONFIGURATIONS MAY BE MORE RESTRICTIVE.
2. ON F-15C/D AIRCRAFT WITH CFT's INSTALLED, THE "CFT/AIRPLANE INTERFACE" CHART MUST ALSO BE USED TO DETERMINE IF THE CFT's ARE MORE RESTRICTIVE.

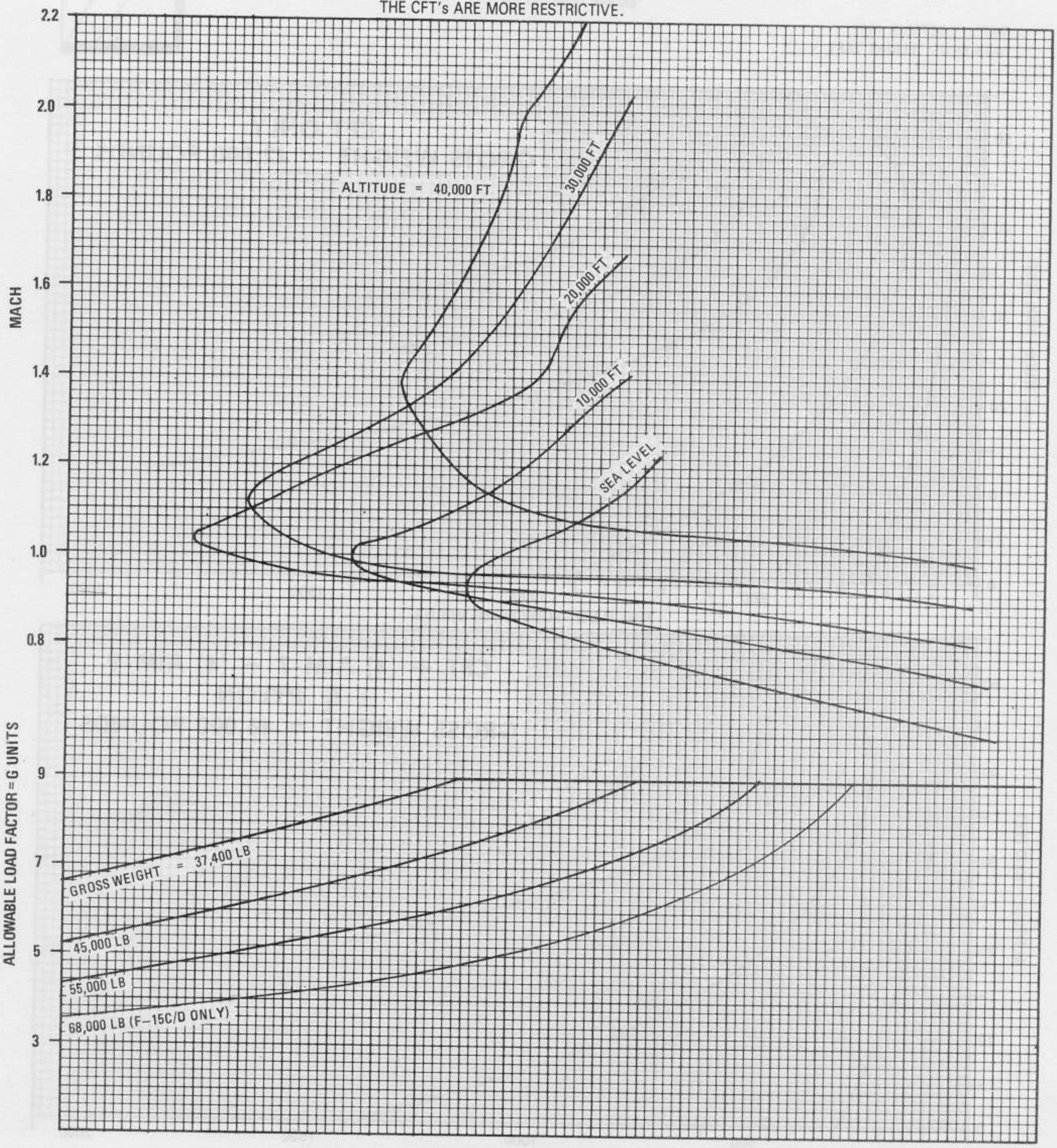
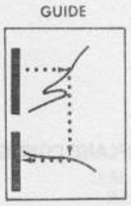


Figure A9-8

OVERLOAD WARNING SYSTEM SYMMETRICAL ALLOWABLE LOAD FACTORS - CFT/AIRPLANE INTERFACE



NOTE

THE "OWS SYMMETRICAL ALLOWABLE LOAD FACTORS" CHART MUST ALSO BE USED.

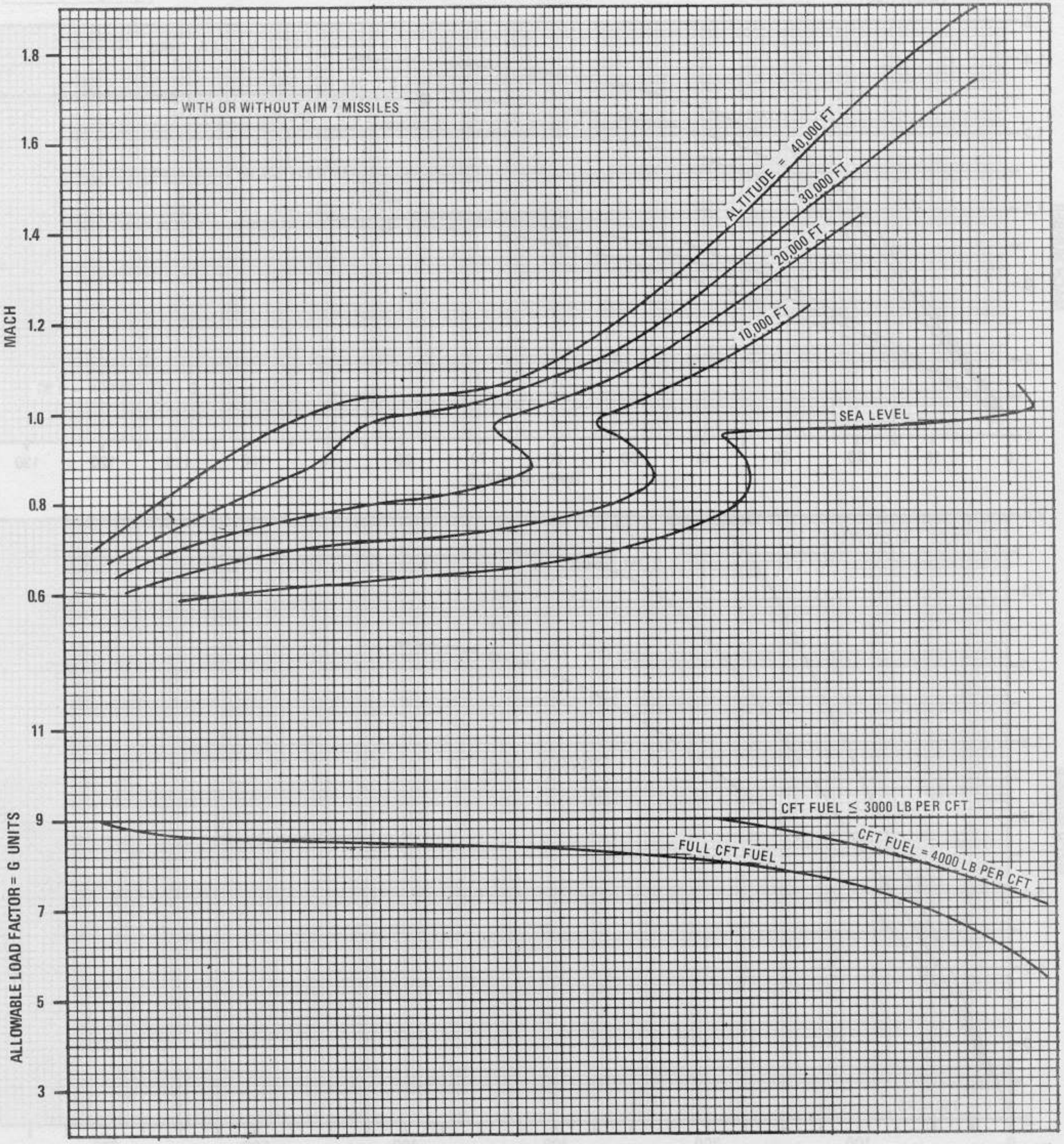
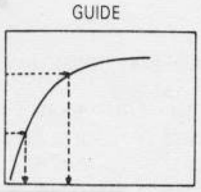


Figure A9-9

LEVEL FLIGHT ACCELERATION

ENGINE TRIM — 102%

INITIAL GROSS WEIGHT — 38,000 POUNDS



AIRPLANE CONFIGURATION
F-15A/C
CLEAN

REMARKS
ENGINES: (2) F100-PW-100
1G LOAD FACTOR

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

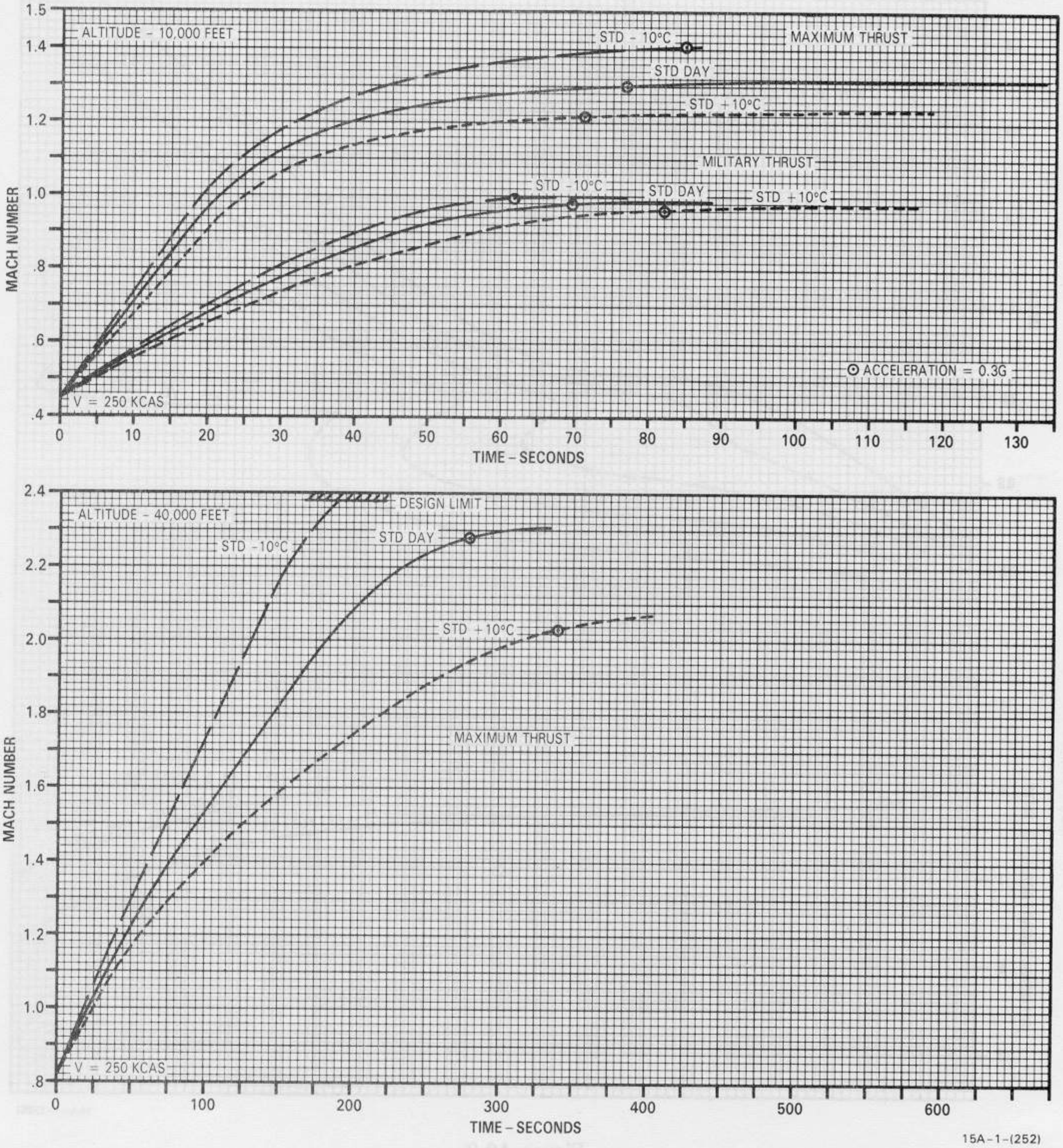
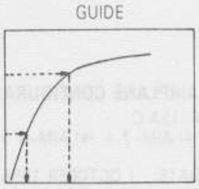


Figure A9-10

LEVEL FLIGHT ACCELERATION

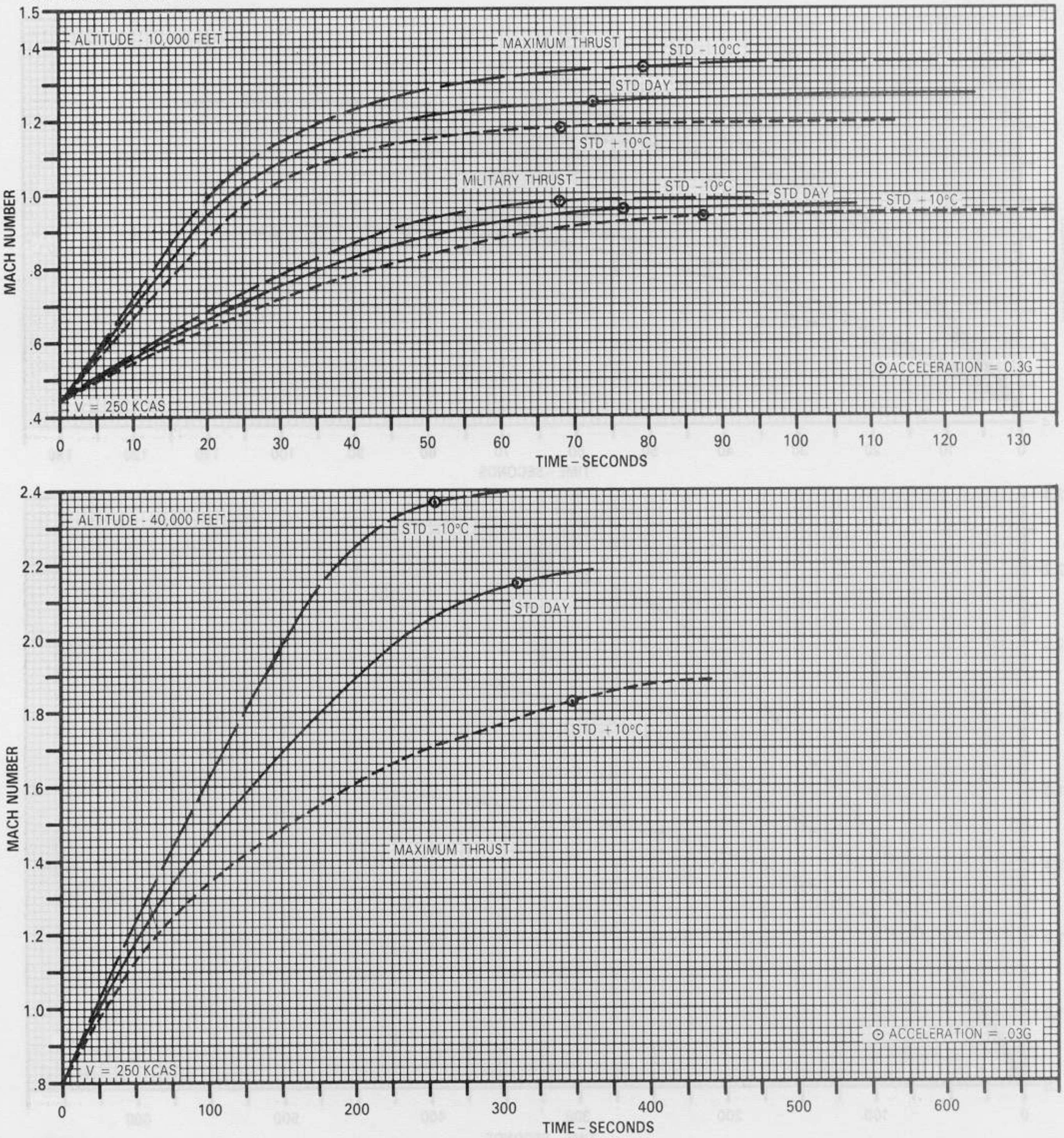
ENGINE TRIM — 102%
INITIAL GROSS WEIGHT — 39,000 POUNDS



AIRPLANE CONFIGURATION
F-15A/C
(3) PYLONS +(4) LAUNCHERS/ADAPTERS

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

REMARKS
ENGINES: (2) F100-PW-100
1G LOAD FACTOR



15A-1 (253)

Figure A9-11

LEVEL FLIGHT ACCELERATION

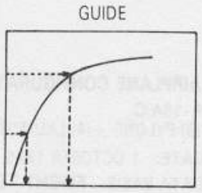
ENGINE TRIM — 102%

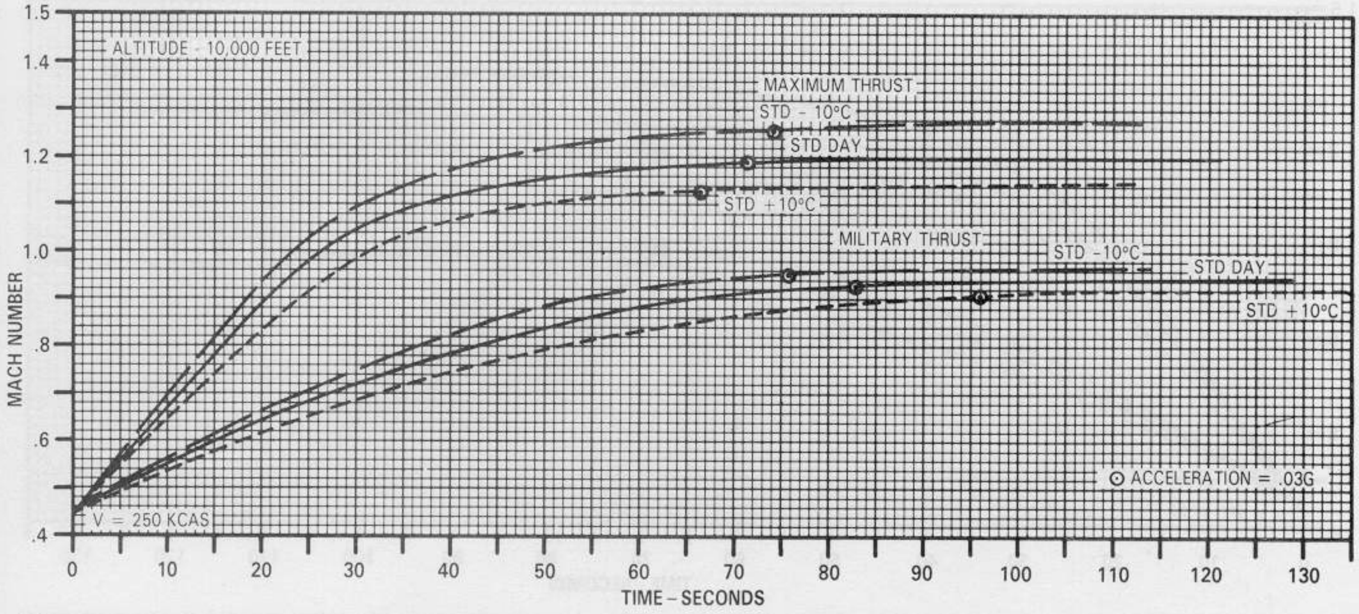
INITIAL GROSS WEIGHT — 42,000 POUNDS

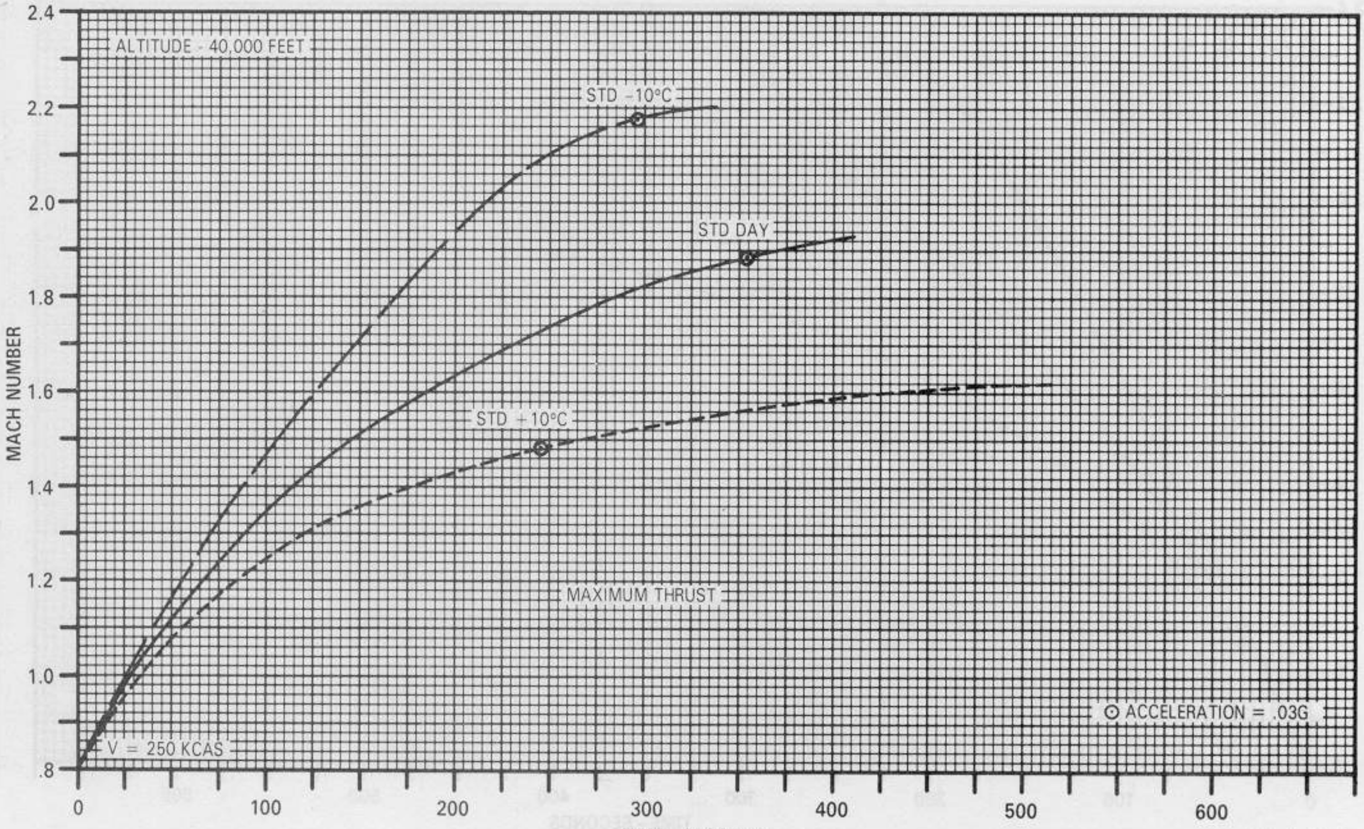
AIRPLANE CONFIGURATION
F-15A/C
(4) AIM-7 + (4) AIM-9 + ℄ PYLON

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

REMARKS
ENGINES: (2) F100-PW-100
1G LOAD FACTOR







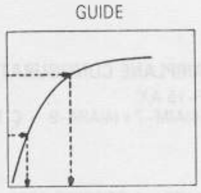
15A-1-(254)

Figure A9-12

LEVEL FLIGHT ACCELERATION

ENGINE TRIM — 102%

INITIAL GROSS WEIGHT — 43,000 POUNDS



AIRPLANE CONFIGURATION

F-15A/C
℄ TANK + (2) WING PYLONS
+ (4) LAUNCHERS/ADAPTERS + (1) AIM-9

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

REMARKS

ENGINES: (2) F100-PW-100
1G LOAD FACTOR

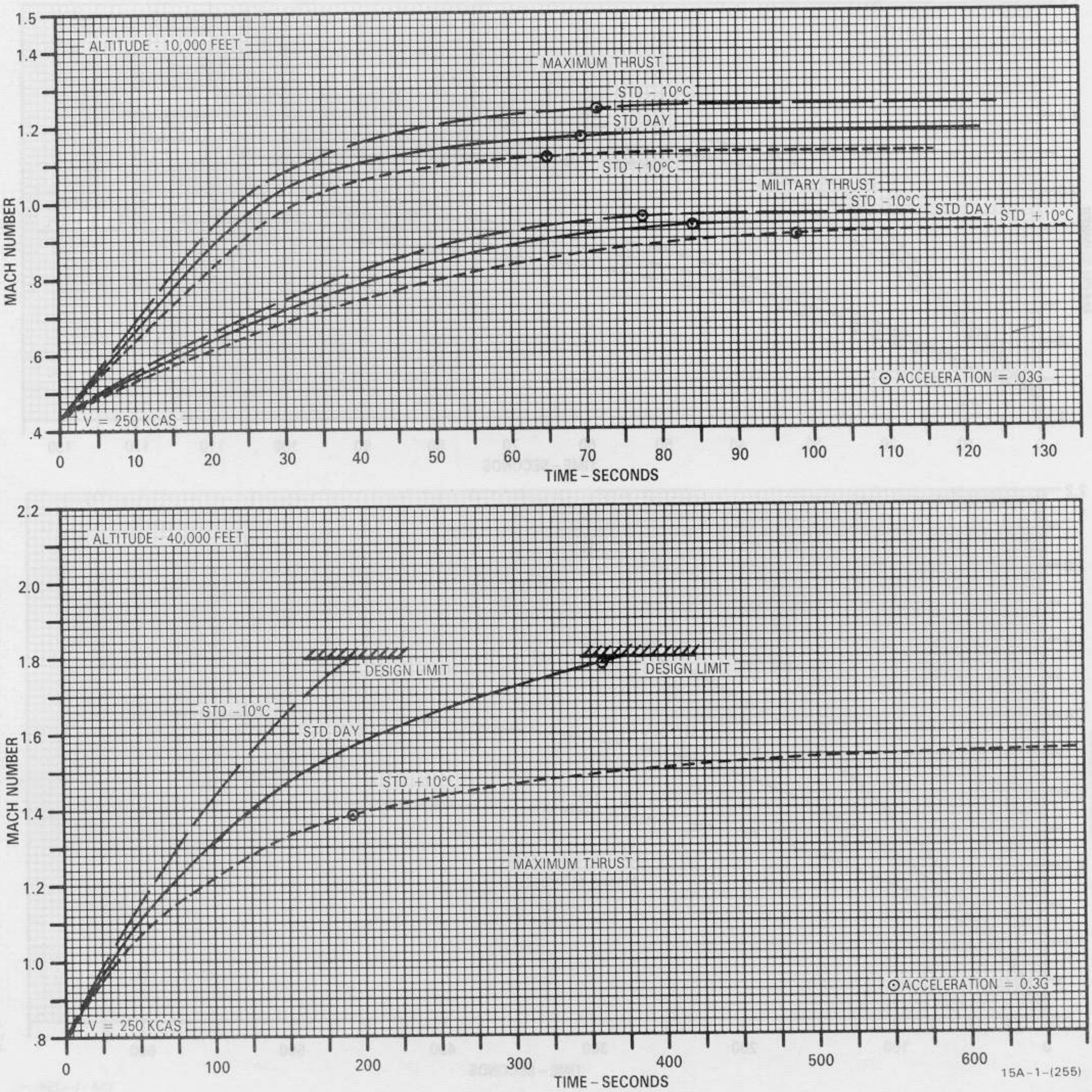


Figure A9-13

LEVEL FLIGHT ACCELERATION

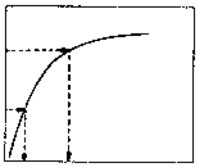
ENGINE TRIM — 102%
INITIAL GROSS WEIGHT — 46,000 POUNDS

AIRPLANE CONFIGURATION
F-15 A/C
(4)AIM-7+(4)AIM-9 + ℄ TANK

REMARKS
ENGINES: (2) F100-PW-100
1G LOAD FACTOR

DATE: 1 OCTOBER 1985
DATA BASIS:**FLIGHT TEST**

GUIDE



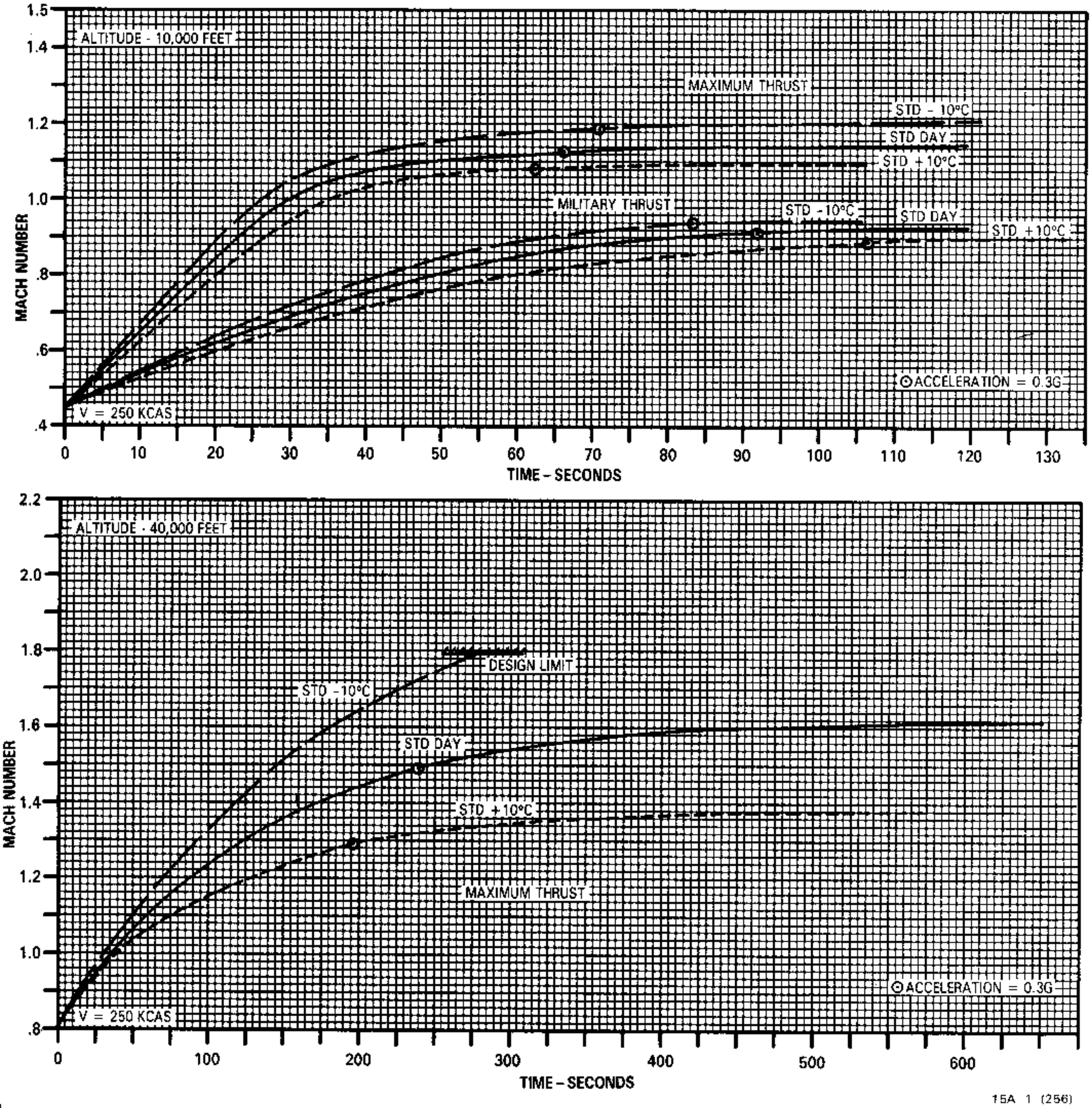
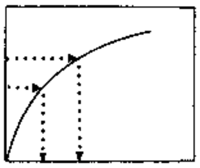


Figure A9-14

LEVEL FLIGHT ACCELERATION

ENGINE TRIM - 102%
INITIAL GROSS WEIGHT - 48,000 POUNDS

GUIDE



AIRPLANE CONFIGURATION
F-15C
CFT

REMARKS
ENGINES: (2) F100-PW-100
1G LOAD FACTOR

DATE: 1 OCTOBER 1985
DATA BASIS: FLIGHT TEST

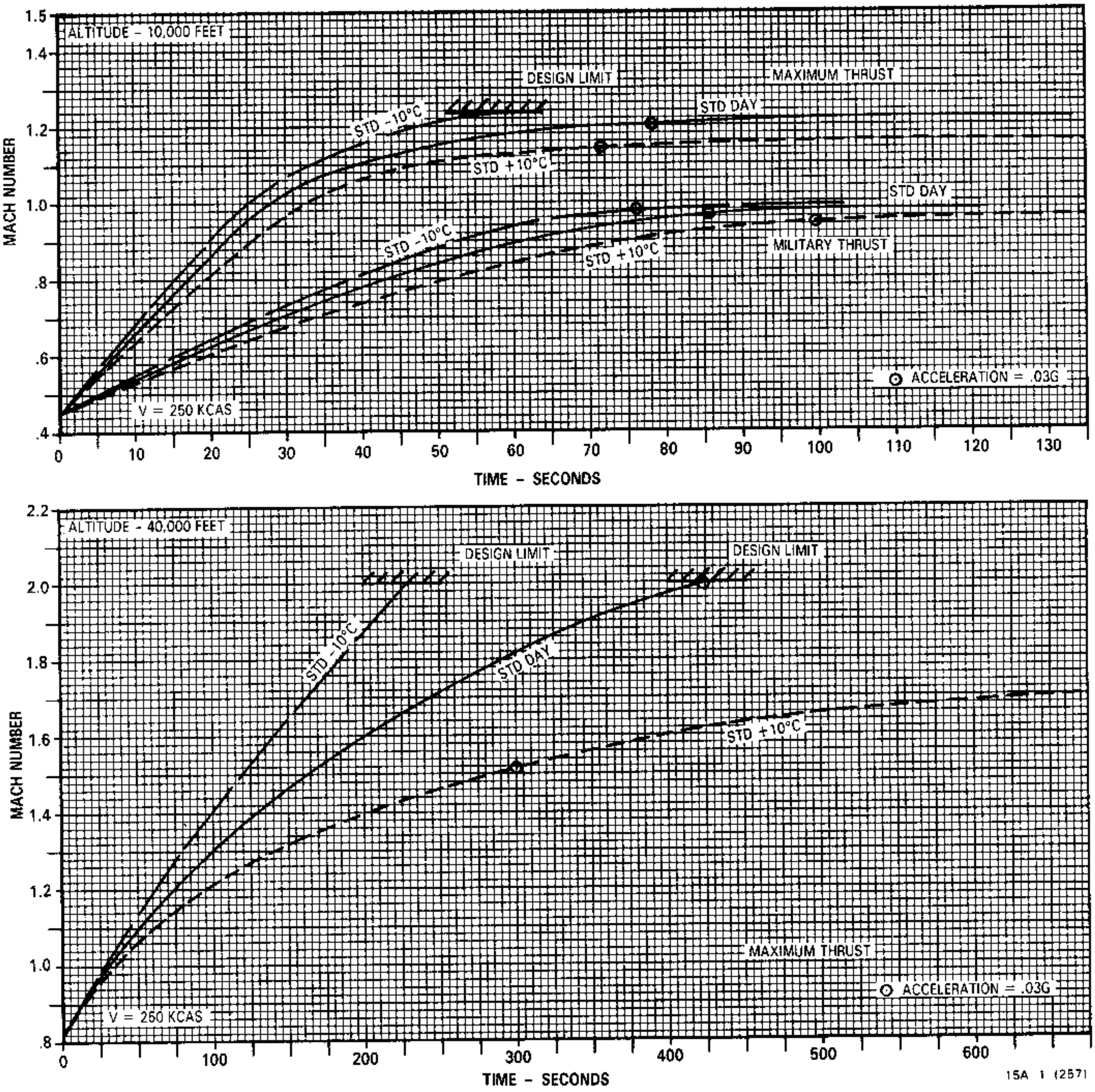


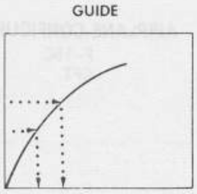
Figure A9-15

LEVEL FLIGHT ACCELERATION

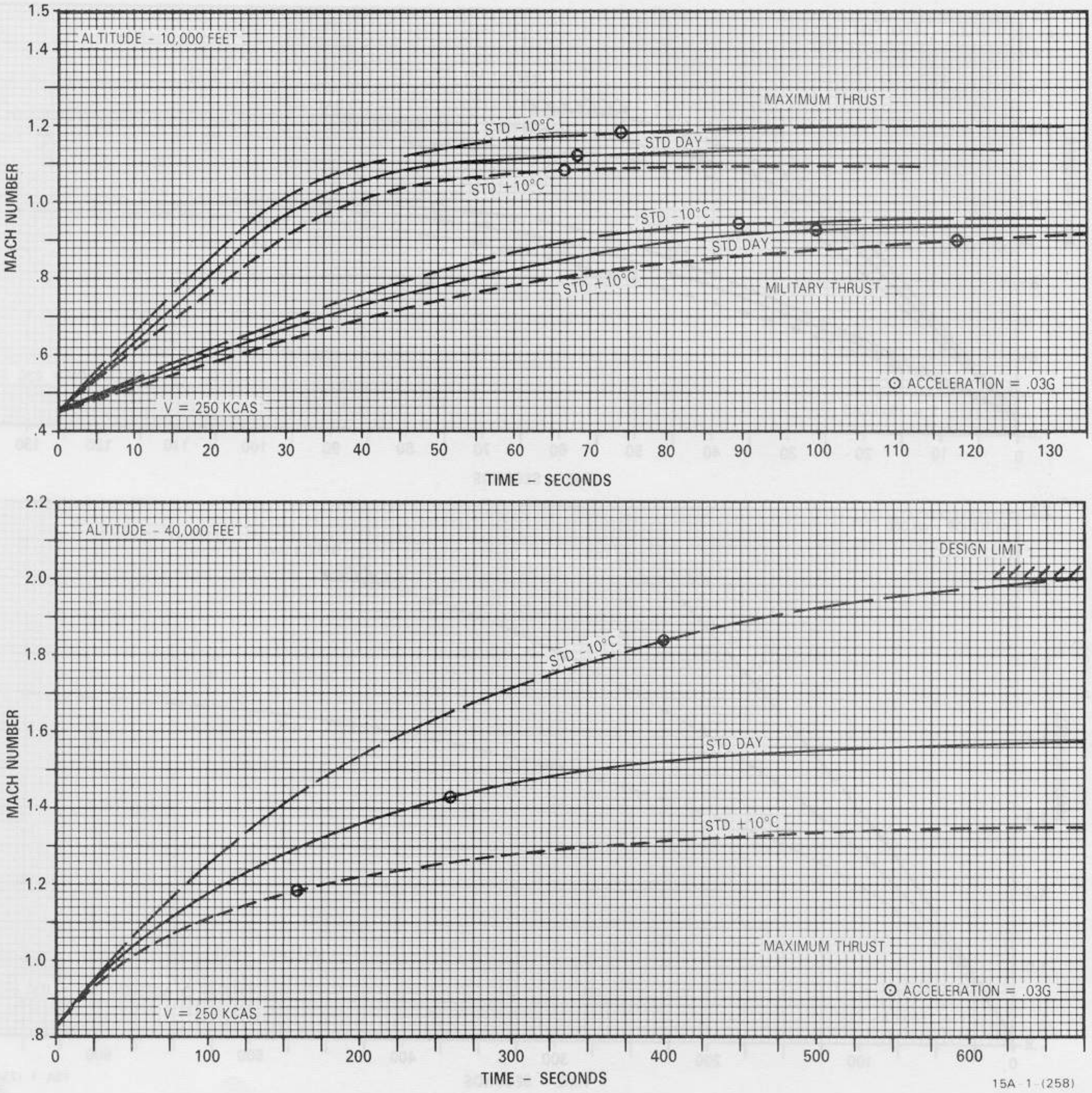
ENGINE TRIM - 102%
INITIAL GROSS WEIGHT - 52,000 POUNDS

AIRPLANE CONFIGURATION
F-15C
CFT
(4) AIM-7 + (4) AIM-9 + ℄ PYLON

REMARKS
ENGINES: (2) F100-PW-100
1G LOAD FACTOR



DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**



15A 1 (258)

Figure A9-16

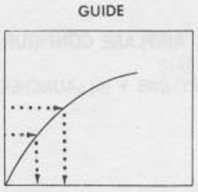
LEVEL FLIGHT ACCELERATION

ENGINE TRIM - 97.7%
INITIAL GROSS WEIGHT - 38,000 POUNDS

AIRPLANE CONFIGURATION
F-15A/C
CLEAN

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

REMARKS
ENGINES: (2) F100-PW-100
1G LOAD FACTOR



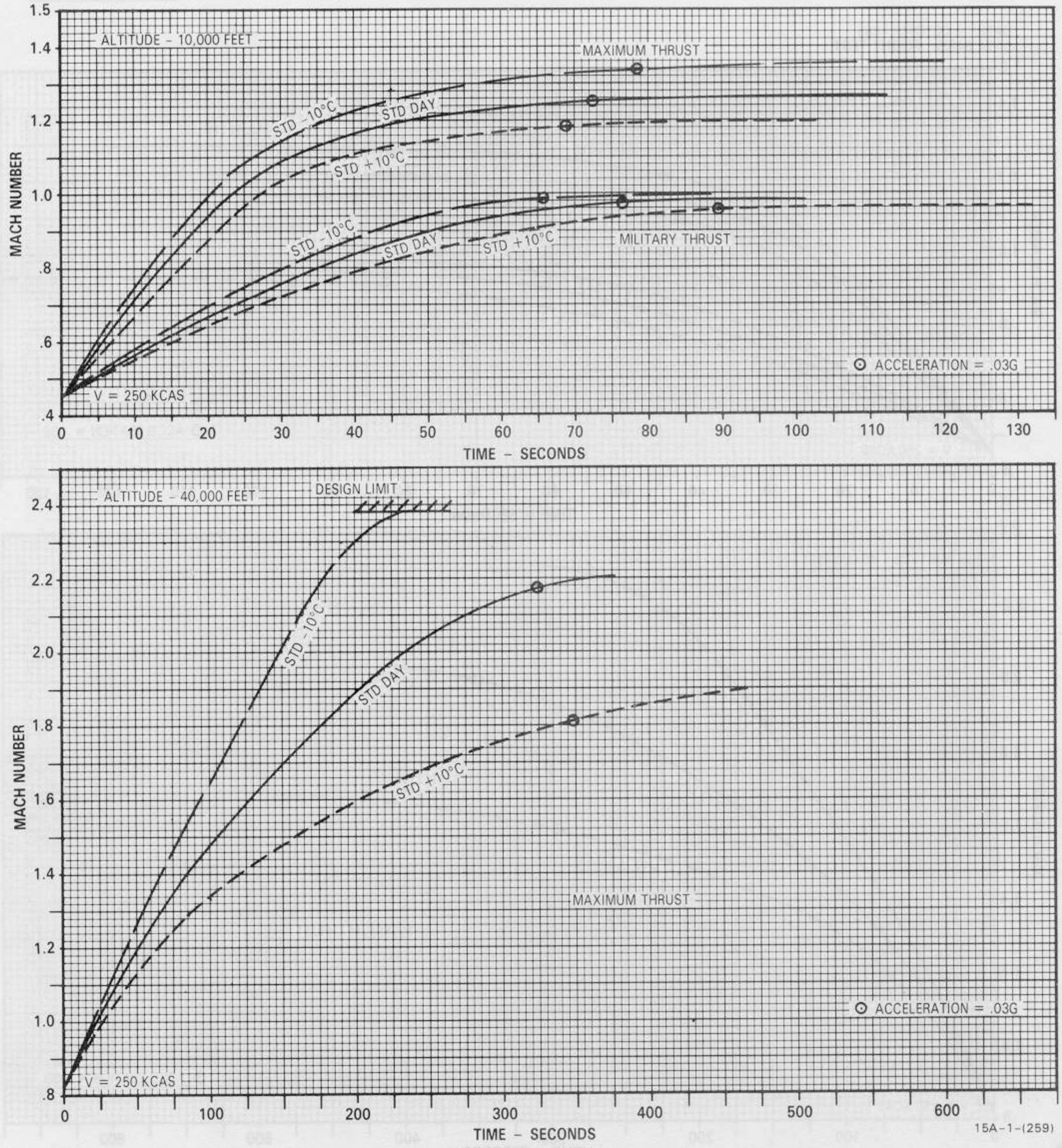


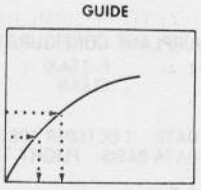
Figure A9-17

LEVEL FLIGHT ACCELERATION

ENGINE TRIM - 97.7%
INITIAL GROSS WEIGHT - 39,000 POUNDS

AIRPLANE CONFIGURATION
F-15A/C
(3) PYLONS + (4) LAUNCHERS/ADAPTERS

REMARKS
ENGINES: (2) F100-PW-100
1G LOAD FACTOR



DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

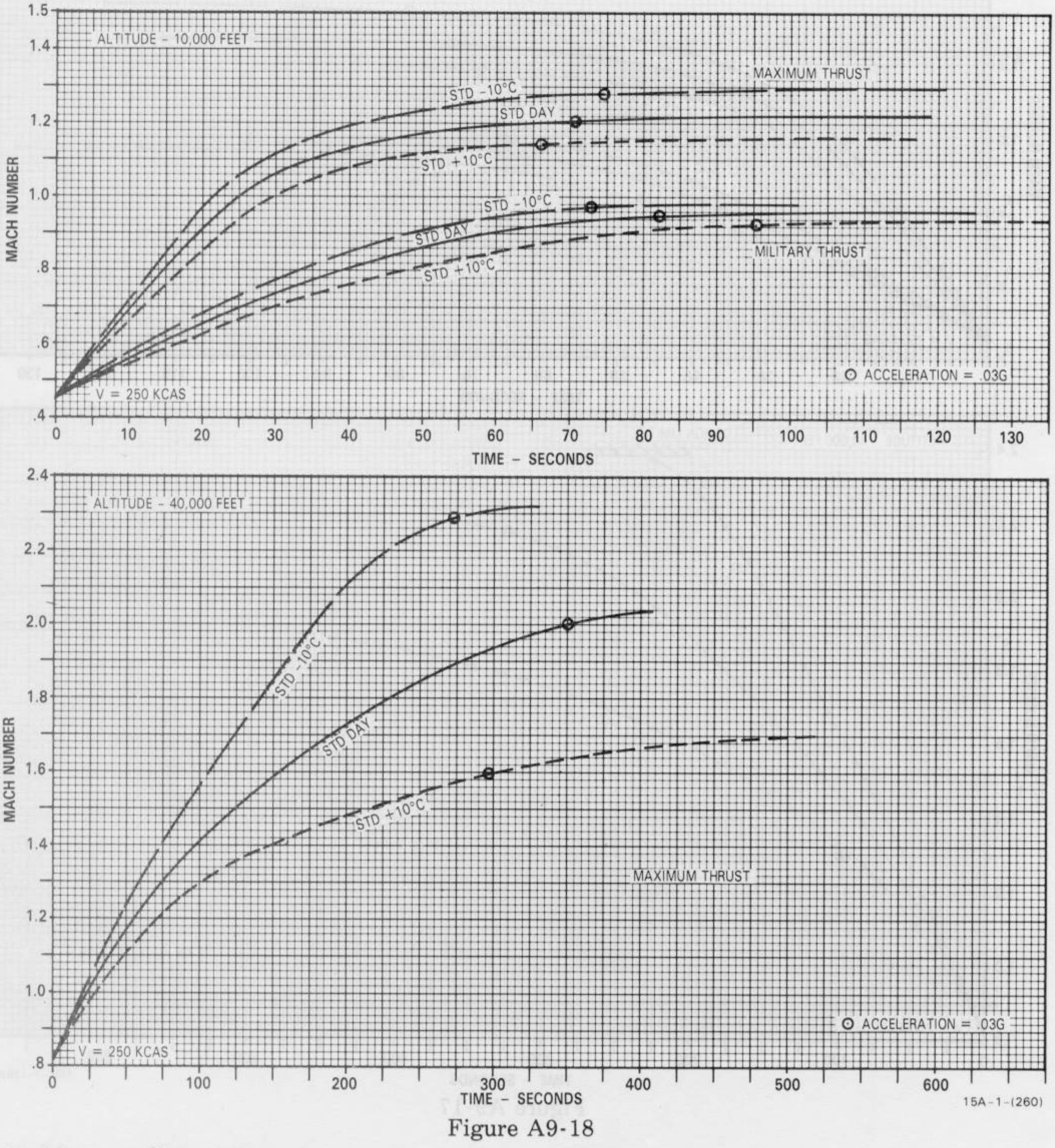


Figure A9-18

LEVEL FLIGHT ACCELERATION

ENGINE TRIM - 97.7%
INITIAL GROSS WEIGHT - 42,000 POUNDS

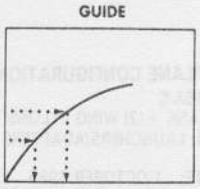
AIRPLANE CONFIGURATION

F-15A/C
(4) AIM-7 + (4) AIM-9 + ℄ PYLON

REMARKS

ENGINES: (2) F100-PW-100
1G LOAD FACTOR

GUIDE



DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

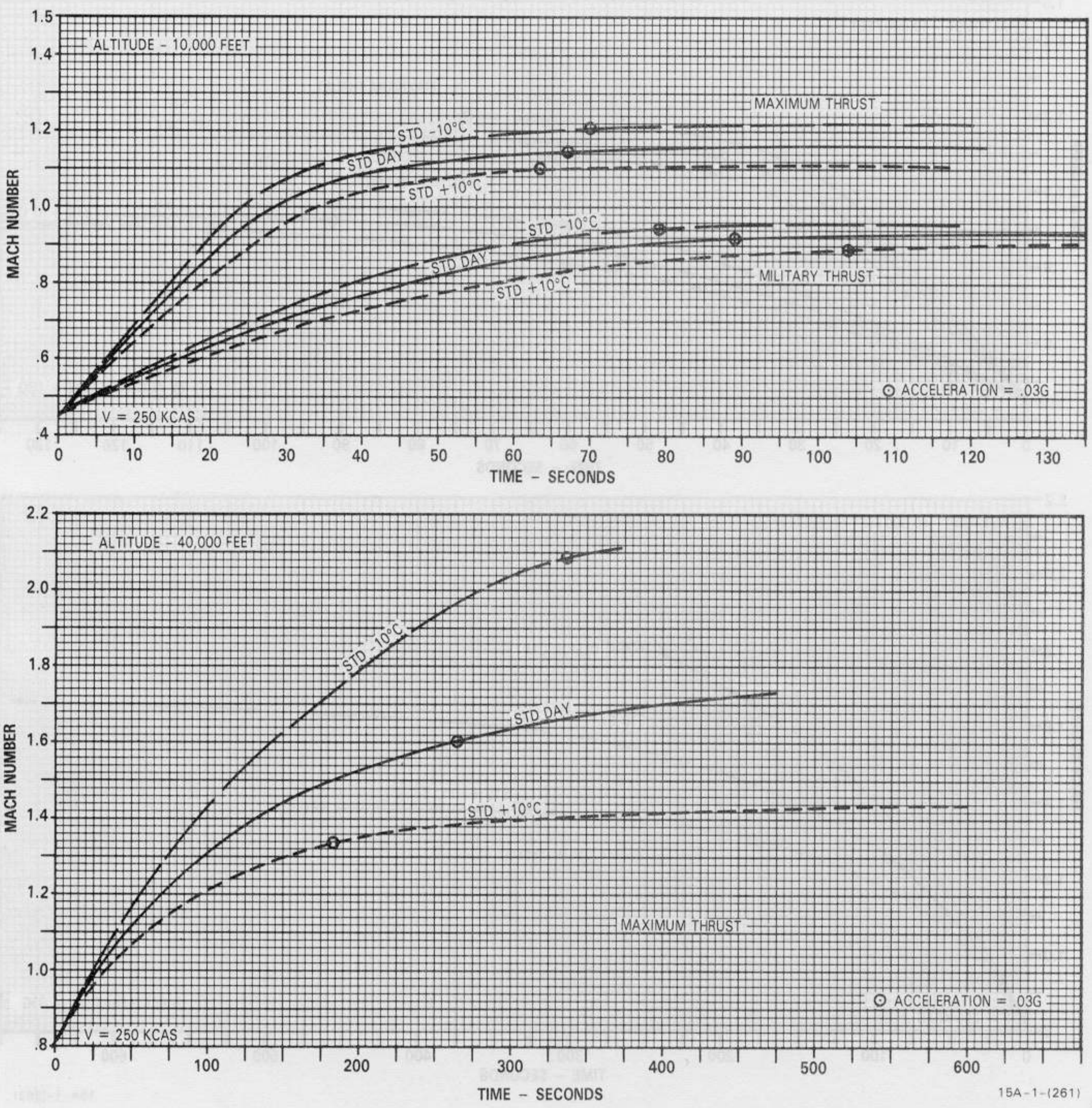
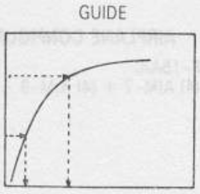


Figure A9-19

LEVEL FLIGHT ACCELERATION

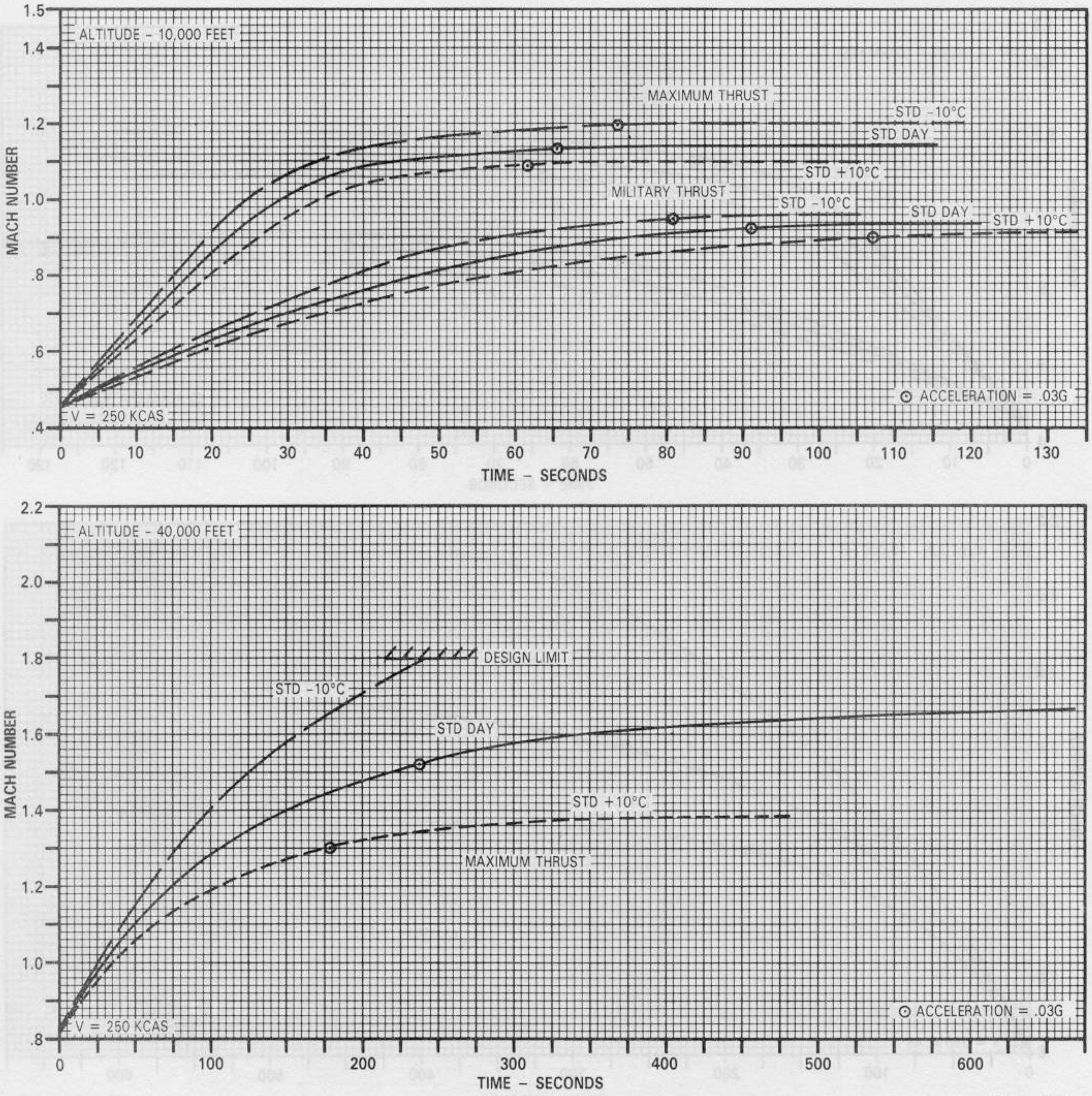
ENGINE TRIM - 97.7%
INITIAL GROSS WEIGHT - 43,000 POUNDS



AIRPLANE CONFIGURATION
F-15A/C
℄ TANK + (2) WING PYLONS
+ (4) LAUNCHERS/ADAPTERS + (1) AIM-9

REMARKS
ENGINES: (2) F100-PW-100
1G LOAD FACTOR

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**



15A-1-(262)

Figure A9-20

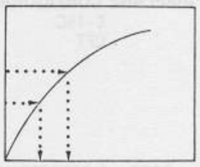
LEVEL FLIGHT ACCELERATION

ENGINE TRIM - 97.7%
INITIAL GROSS WEIGHT - 46,000 POUNDS

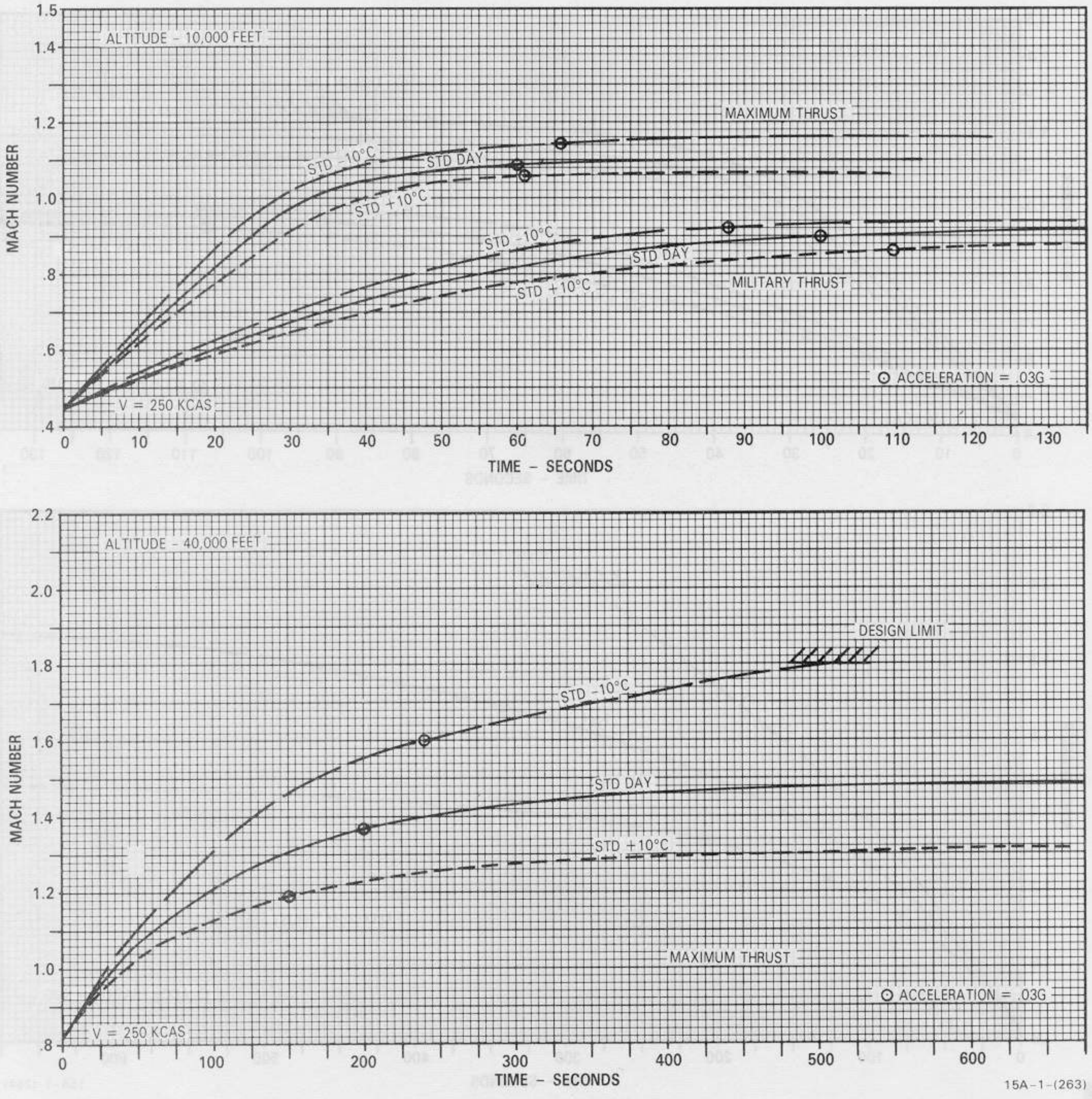
AIRPLANE CONFIGURATION
F-15A/C
(4)AIM-7 + (4)AIM-9 + ℄ TANK

REMARKS
ENGINES: (2) F100-PW-100
1G LOAD FACTOR

GUIDE



DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**



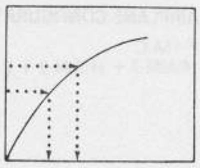
15A-1-(263)

Figure A9-21

LEVEL FLIGHT ACCELERATION

ENGINE TRIM - 97.7%
INITIAL GROSS WEIGHT - 48,000 POUNDS

GUIDE



AIRPLANE CONFIGURATION
F-15C
CFT

REMARKS
ENGINES: (2) F100-PW-100
1G LOAD FACTOR

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

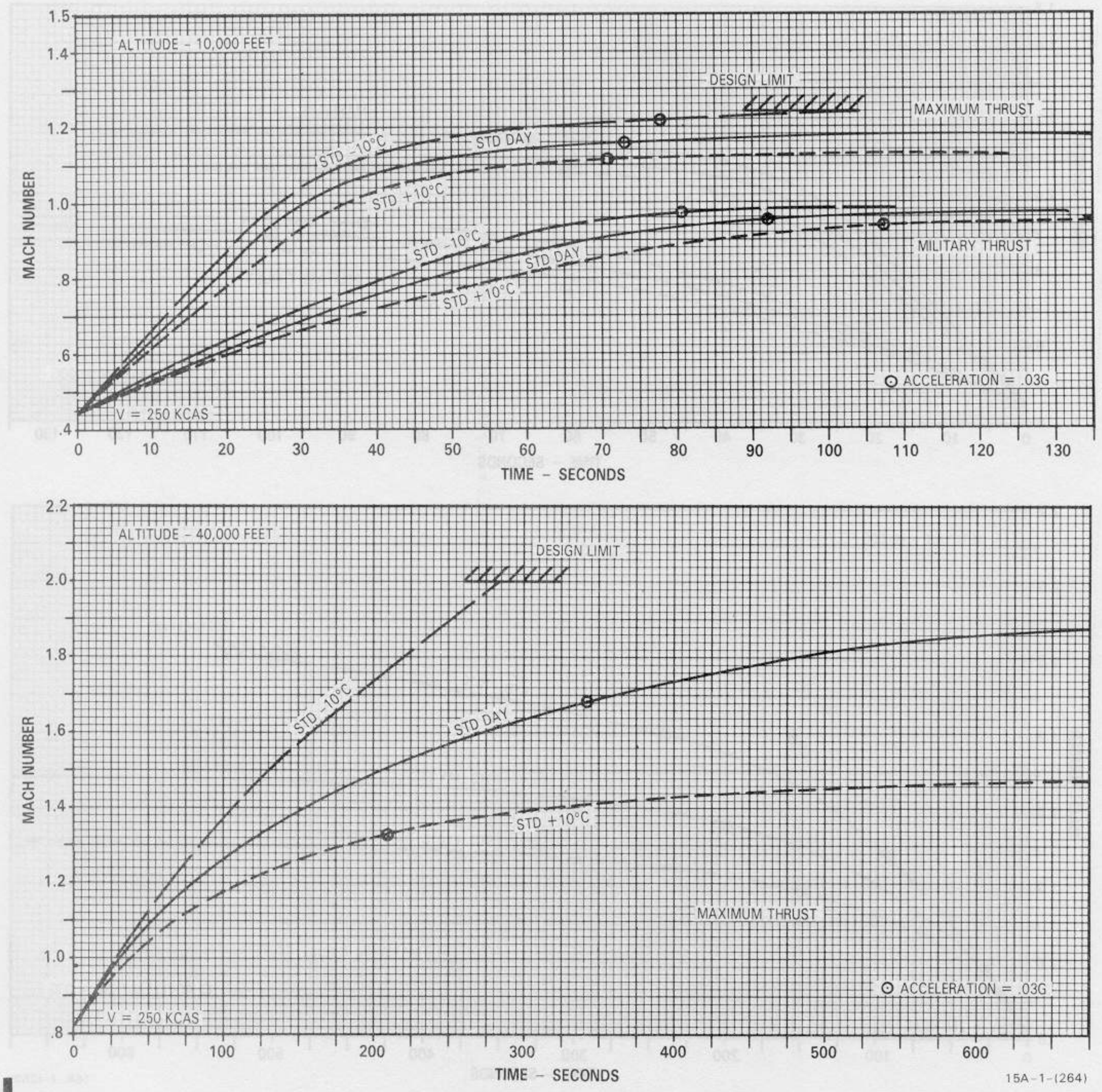


Figure A9-22

LEVEL FLIGHT ACCELERATION

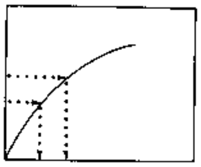
ENGINE TRIM - 97.7%
INITIAL GROSS WEIGHT - 52,000 POUNDS

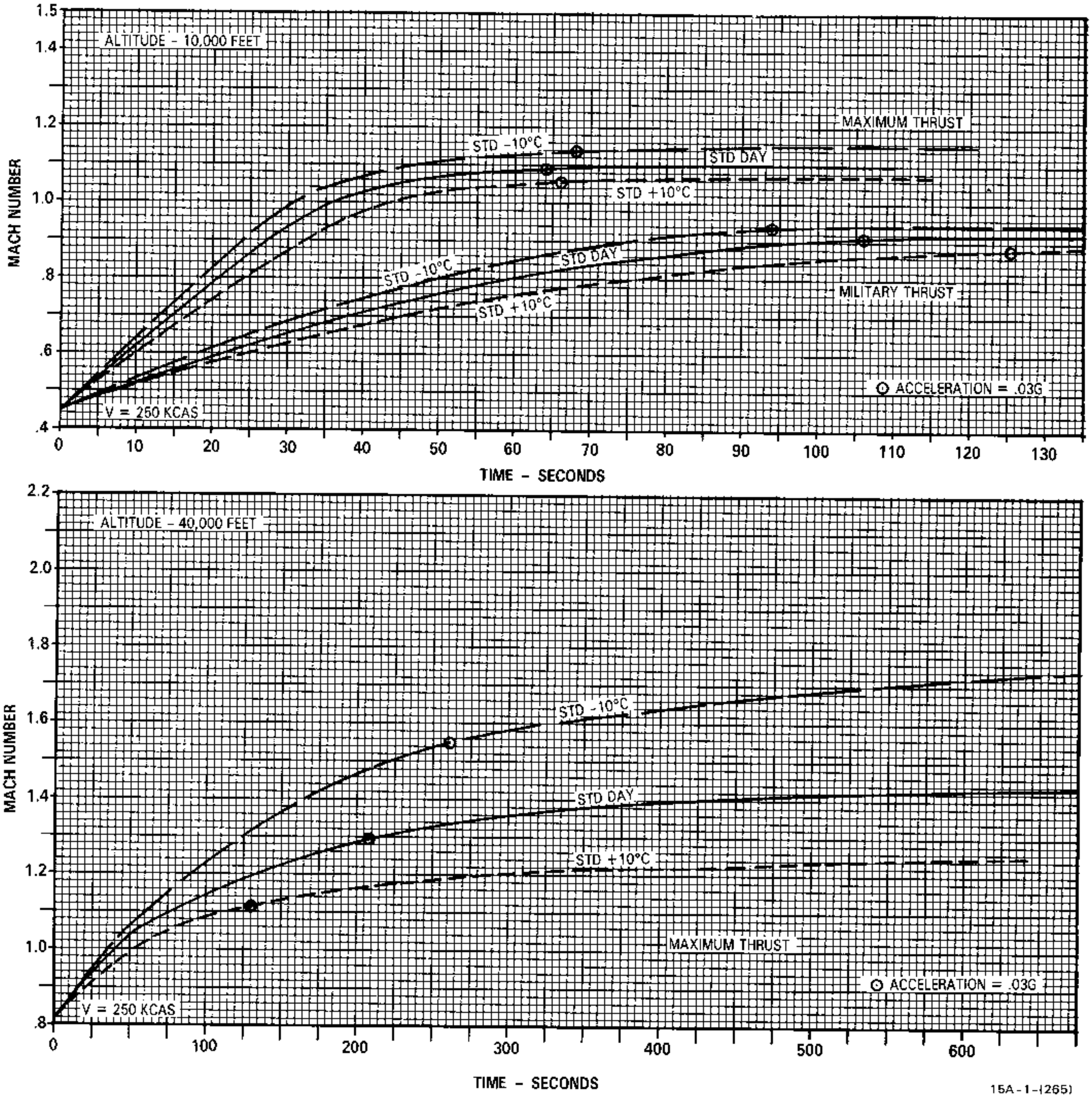
AIRPLANE CONFIGURATION
F-15C
CFT
(4) AIM-7 · (4) AIM-9 + ℄ PYLON

REMARKS
ENGINES: (2) F100-PW-100
1G LOAD FACTOR

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

GUIDE





15A-1-(265)

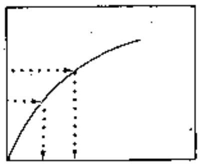
Figure A9-23

LEVEL FLIGHT ACCELERATION

ENGINE TRIM - 95%

INITIAL GROSS WEIGHT - 38,000 POUNDS

GUIDE



AIRPLANE CONFIGURATION
F-15A/C
CLEAN

REMARKS
ENGINES: (2) F100-PW-100
1G LOAD FACTOR

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

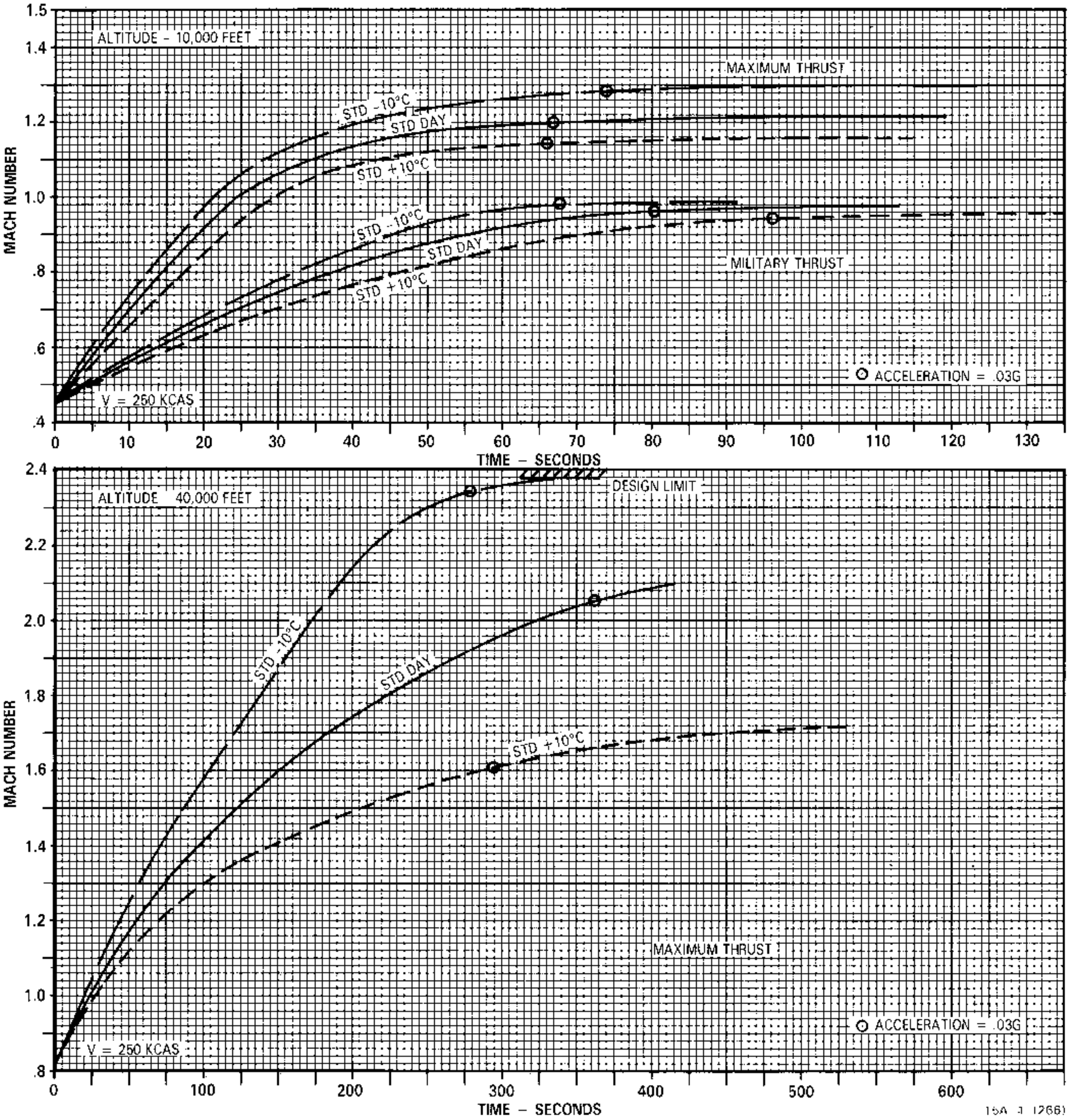


Figure A9-24

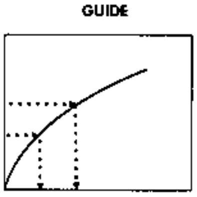
LEVEL FLIGHT ACCELERATION

ENGINE TRIM - 95%
INITIAL GROSS WEIGHT - 39,000 POUNDS

AIRPLANE CONFIGURATION
F-15A/C
(3) PYLONS + (4) LAUNCHERS/ADAPTERS

REMARKS
ENGINES: (2) F100-PW-100
1G LOAD FACTOR

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**



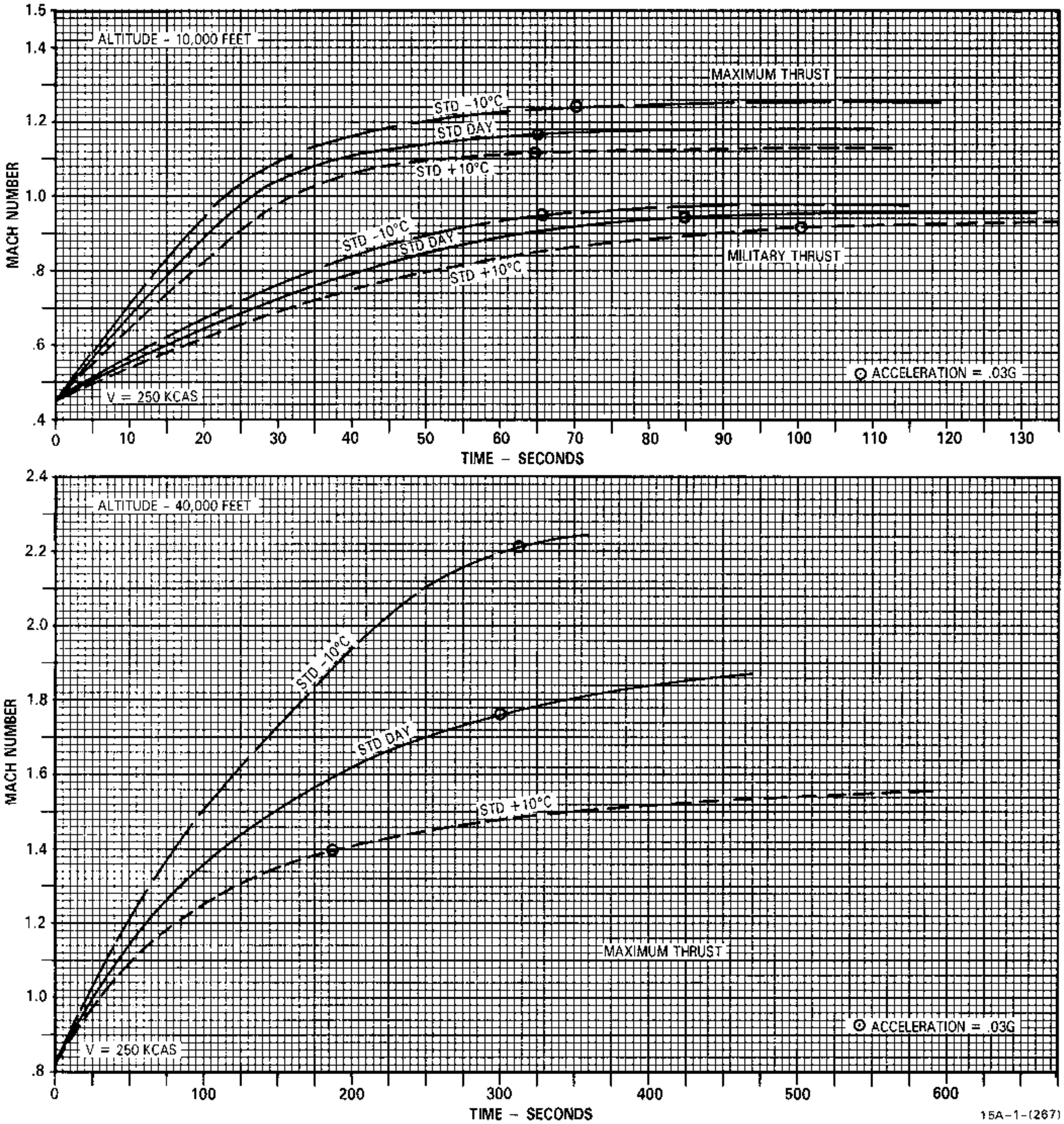
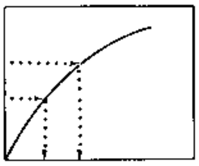


Figure A9-25

LEVEL FLIGHT ACCELERATION

ENGINE TRIM - 95%
INITIAL GROSS WEIGHT - 42,000 POUNDS

GUIDE

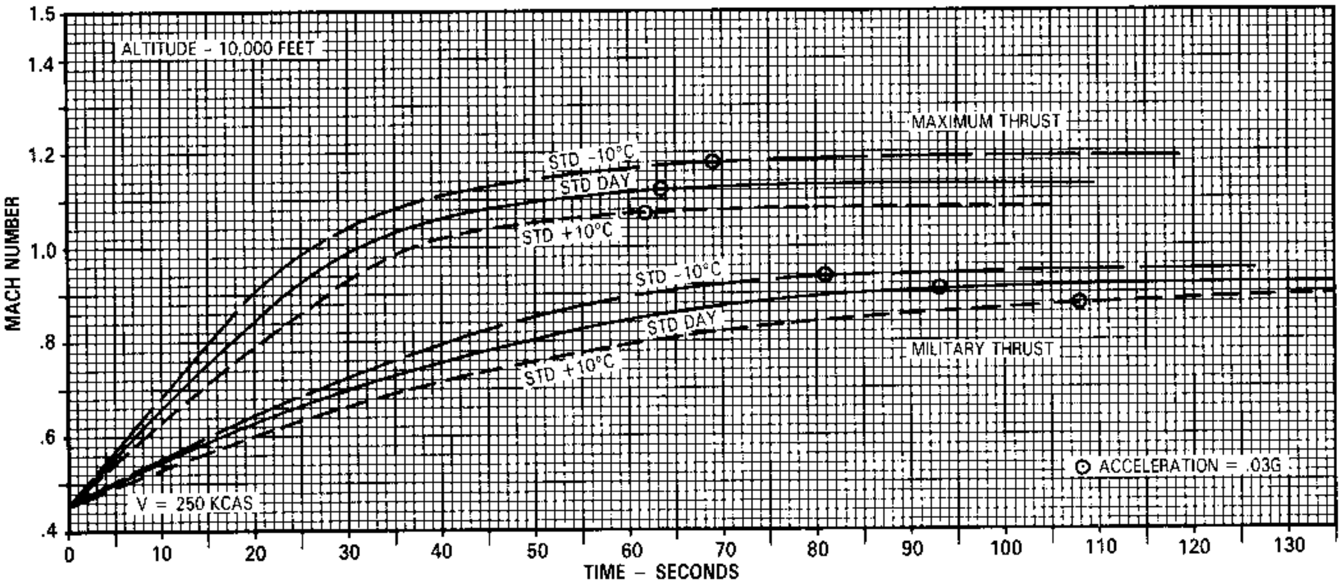


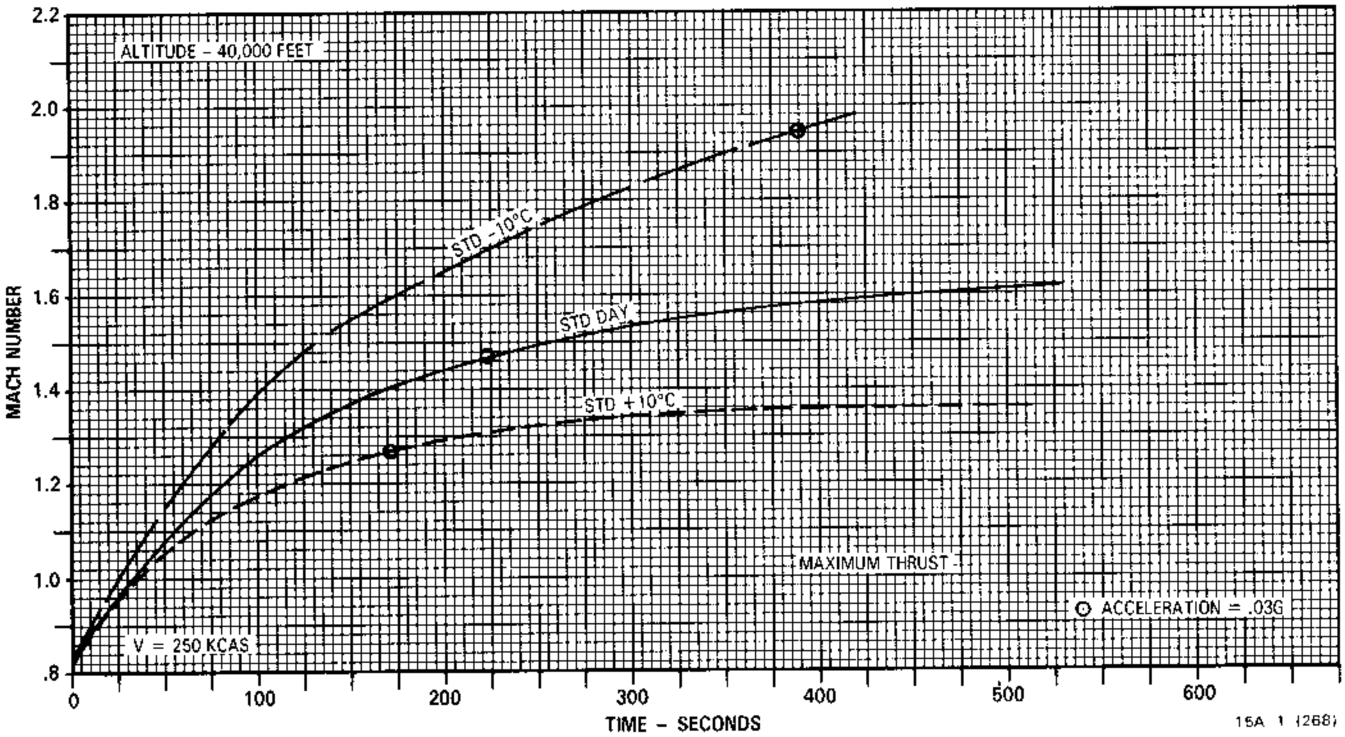
AIRPLANE CONFIGURATION

F-15A/C
(4) AIM-7 + (4) AIM-9 ; ℄ PYLON

REMARKS
ENGINES: (2) F100-PW-100
1G LOAD FACTOR

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**





15A 1 (268)

Figure A9-26

LEVEL FLIGHT ACCELERATION

ENGINE TRIM - 95%

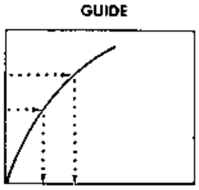
INITIAL GROSS WEIGHT - 43,000 POUNDS

AIRPLANE CONFIGURATION

F-15A/C
℄ TANK + (2) WING PYLONS
+ (4) LAUNCHERS/ADAPTERS + (1) AIM-9

REMARKS

ENGINES: (2) F100-PW-100
1G LOAD FACTOR



DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

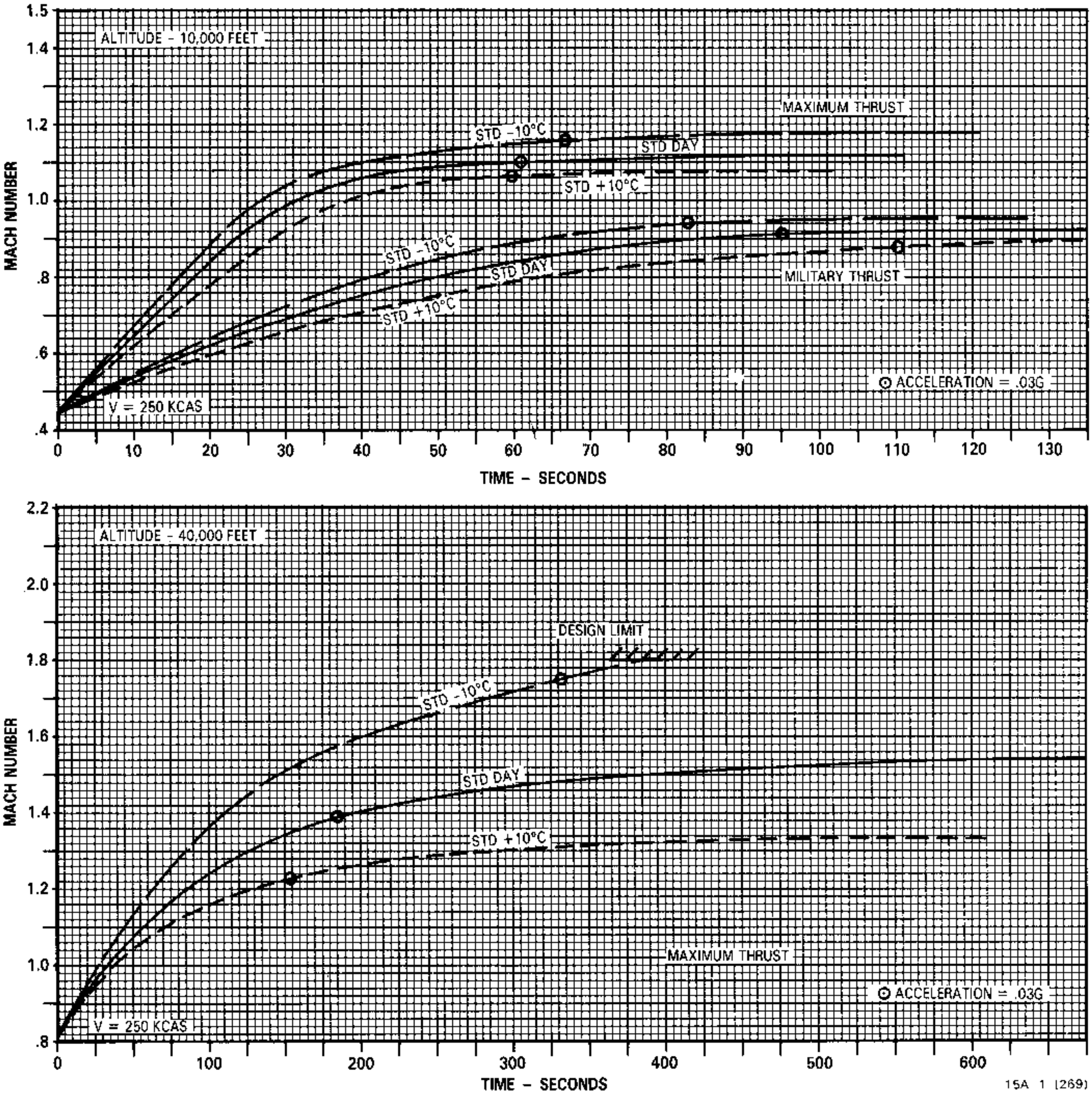
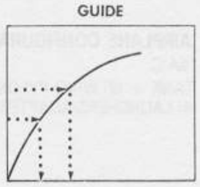


Figure A9-27

LEVEL FLIGHT ACCELERATION

ENGINE TRIM - 95%
INITIAL GROSS WEIGHT - 46,000 POUNDS



AIRPLANE CONFIGURATION
F-15A/C
(4) AIM-7 + AIM-9 + ℄ TANK

REMARKS
ENGINES: (2) F100-PW-100
1G LOAD FACTOR

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

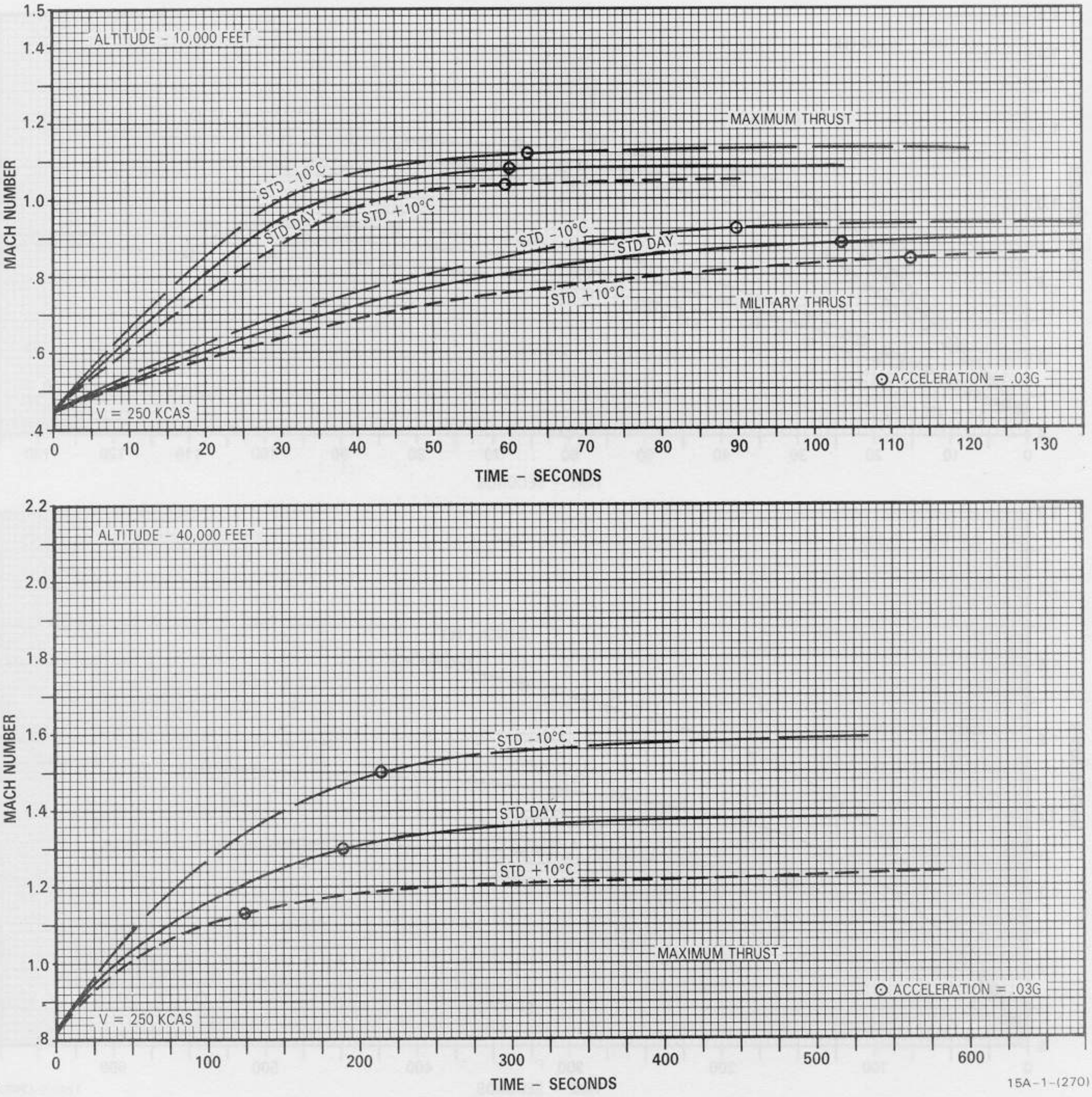


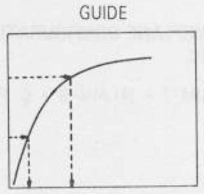
Figure A9-28

LEVEL FLIGHT ACCELERATION

ENGINE TRIM - 95%

INITIAL GROSS WEIGHT - 48,000 POUNDS

REMARKS
ENGINES: (2) F100-PW-100
1G LOAD FACTOR



AIRPLANE CONFIGURATION
F-15C
CFT

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

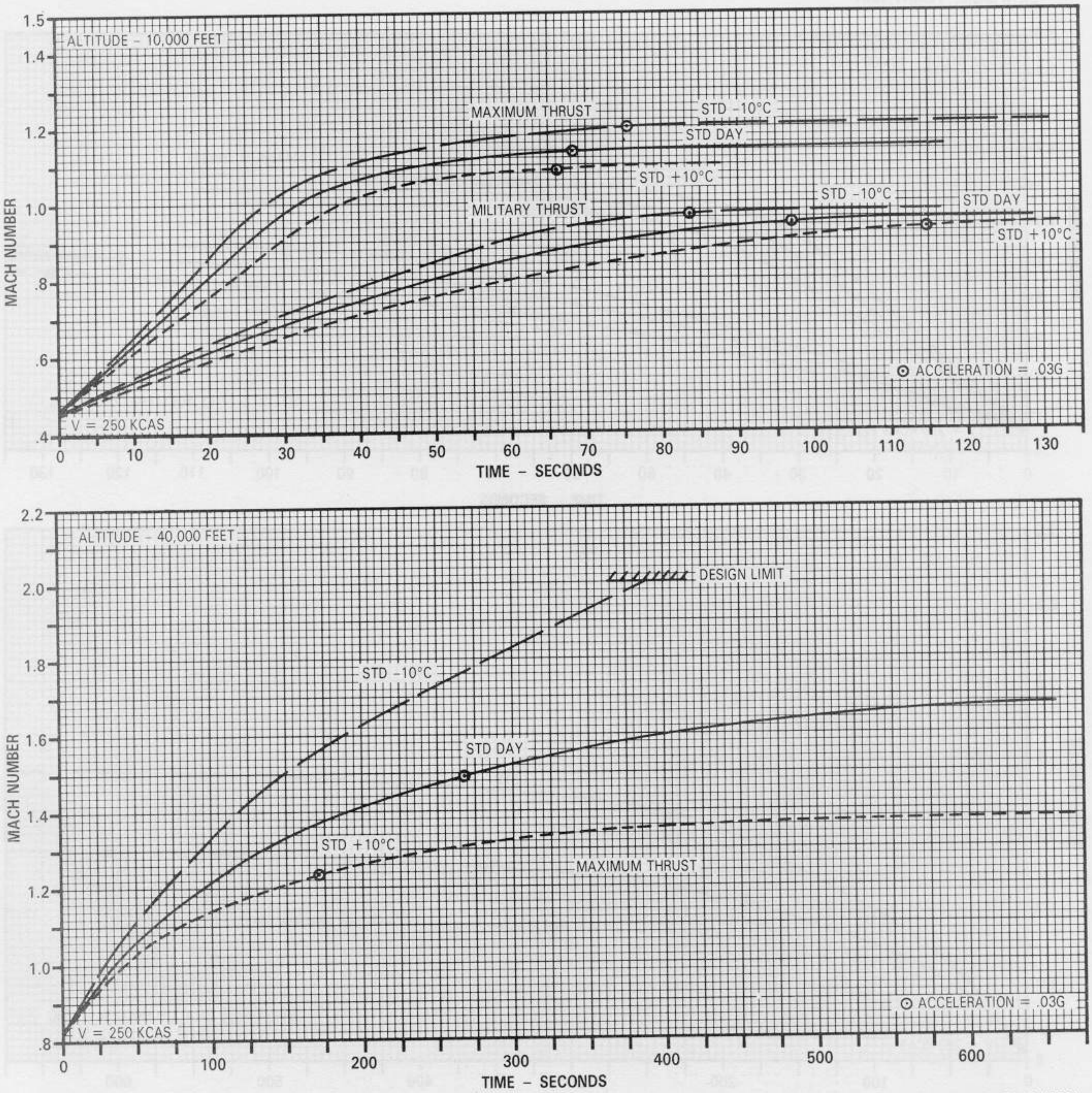
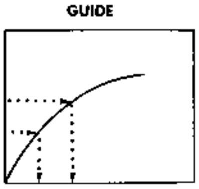


Figure A9-29

LEVEL FLIGHT ACCELERATION

ENGINE TRIM - 95%
INITIAL GROSS WEIGHT - 52,000 POUNDS



AIRPLANE CONFIGURATION
F-15C
CFT
(4) AIM-7 + (4) AIM-9 – ℄ PYLON

REMARKS
ENGINES: (2) F100-PW-100
1G LOAD FACTOR

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

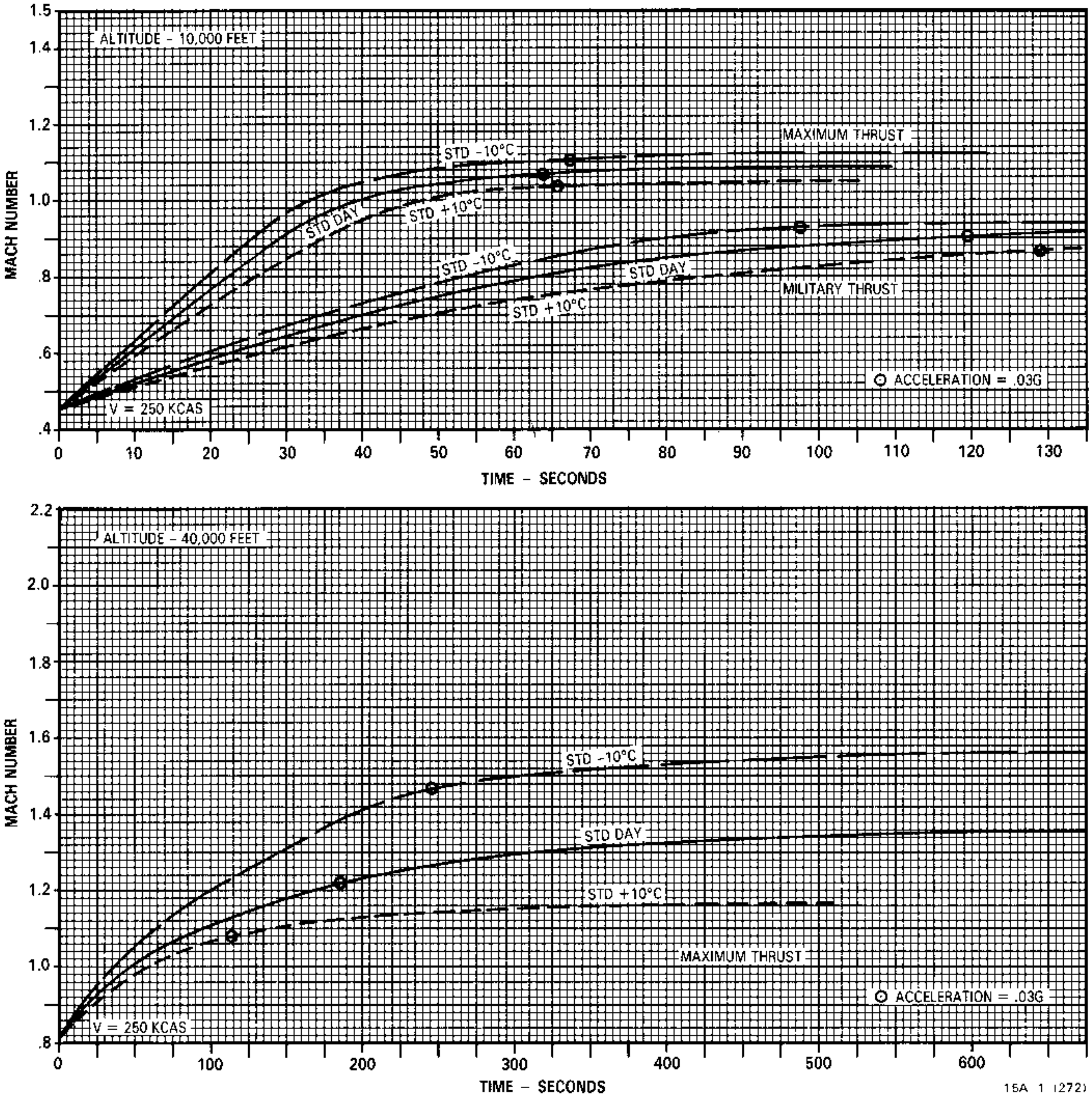
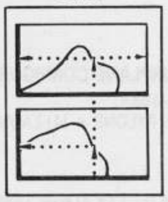


Figure A9-30

SUSTAINED LEVEL TURNS

GROSS WEIGHT-35,000 POUNDS
MAXIMUM THRUST

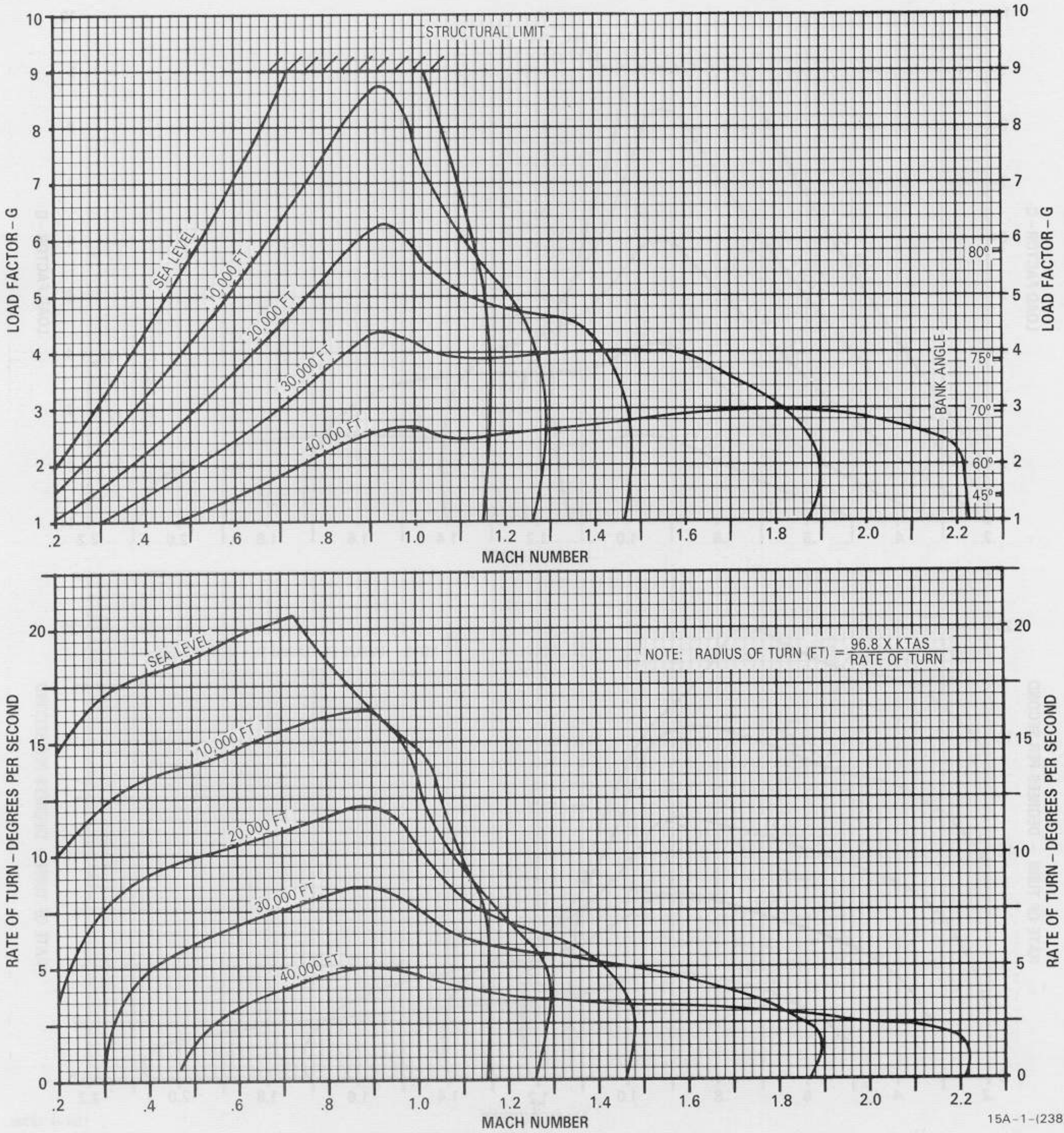
GUIDE



AIRPLANE CONFIGURATION
F-15A/C
CLEAN

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

REMARKS
ENGINE(S): (2)F100-PW-100
U.S. STANDARD DAY, 1966
ENGINE TRIM: 97.7%



NOTE: RADIUS OF TURN (FT) = $\frac{96.8 \text{ X KTAS}}{\text{RATE OF TURN}}$

15A-1-(238)

Figure A9-31

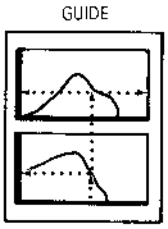
SUSTAINED LEVEL TURNS

GROSS WEIGHT-36,000 POUNDS
MAXIMUM THRUST

AIRPLANE CONFIGURATION
F-15A/C
(3) PYLONS + (4) LAUNCHERS/ADAPTERS

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

REMARKS
ENGINES (2) F-100 PW-100
U.S. STANDARD DAY, 1966
ENGINE TRIM 97.7%



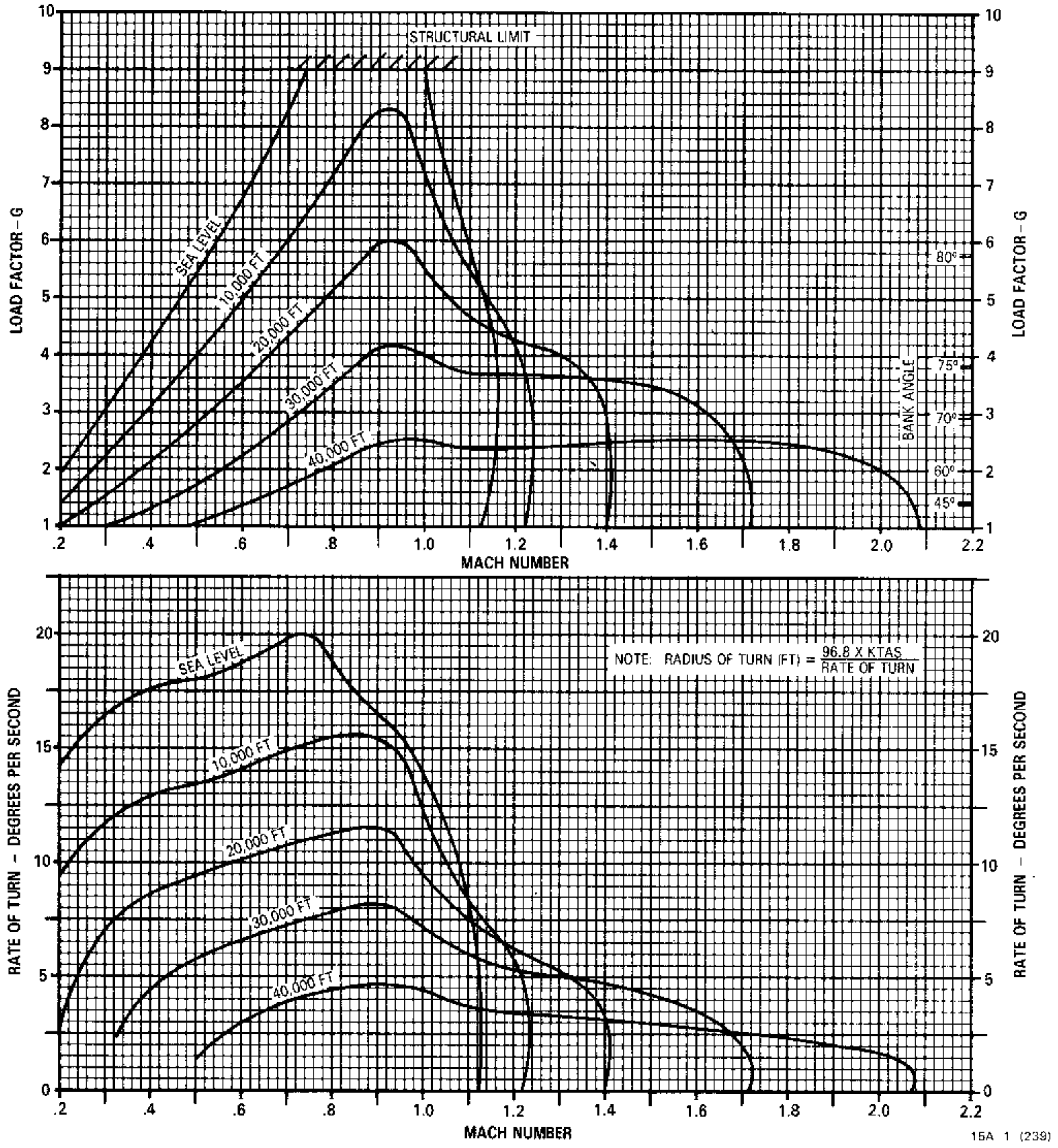


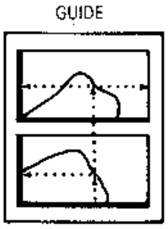
Figure A9-32

SUSTAINED LEVEL TURNS
GROSS WEIGHT-39,000 POUNDS
MAXIMUM THRUST

AIRPLANE CONFIGURATION
F-15A/C
(4) AIM-7 + (4) AIM-9 + ℄ PYLON

REMARKS
ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1 1966
ENGINE TRIM: 97.7%

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**



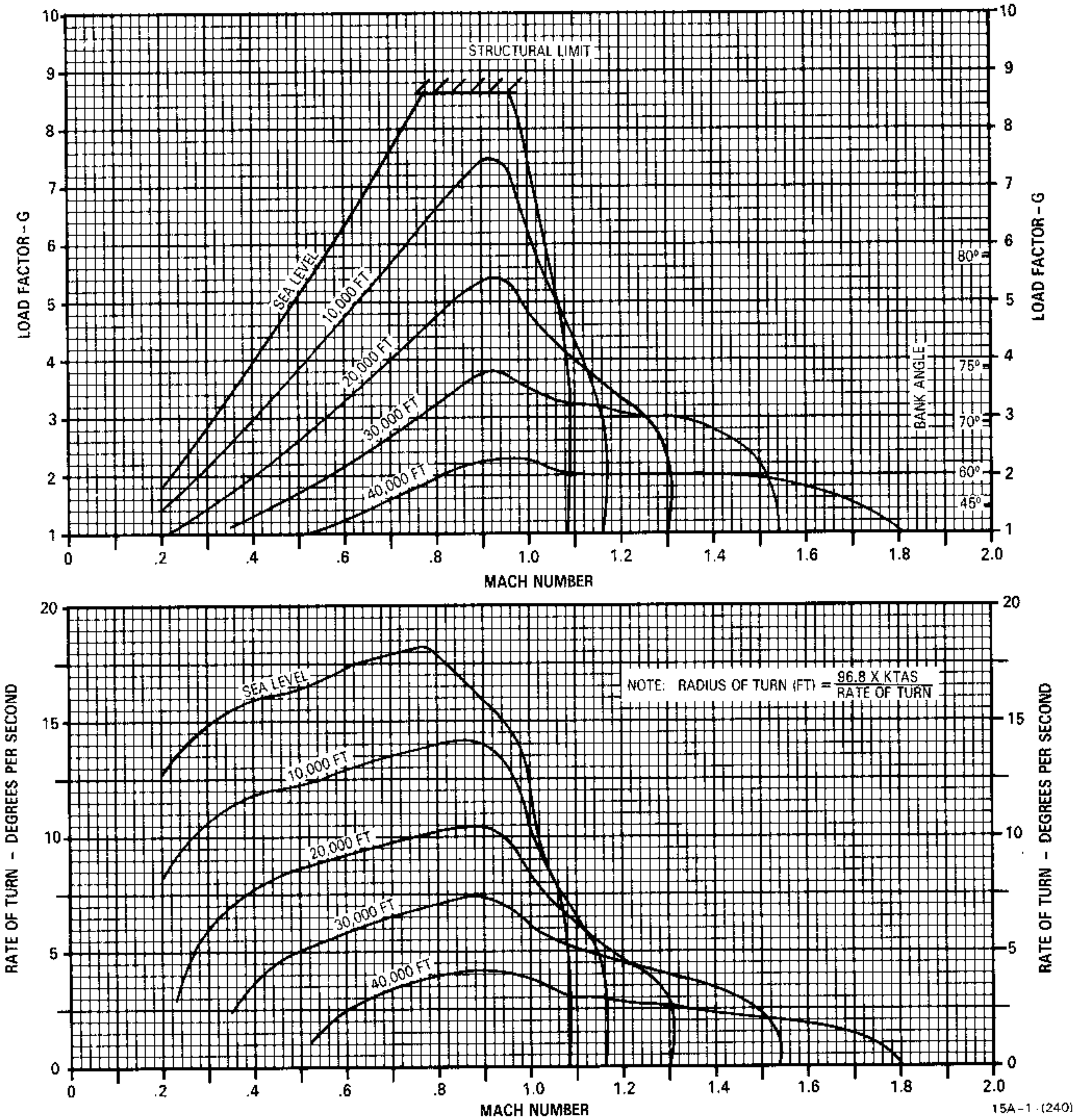


Figure A9-33

SUSTAINED LEVEL TURNS
GROSS WEIGHT-39,000 POUNDS
MAXIMUM THRUST

AIRPLANE CONFIGURATION

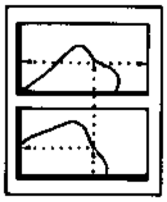
F-15A/C
℄ TANK + (2) WING PYLONS +
(4) LAUNCHERS/ADAPTERS + (1) AIM-9

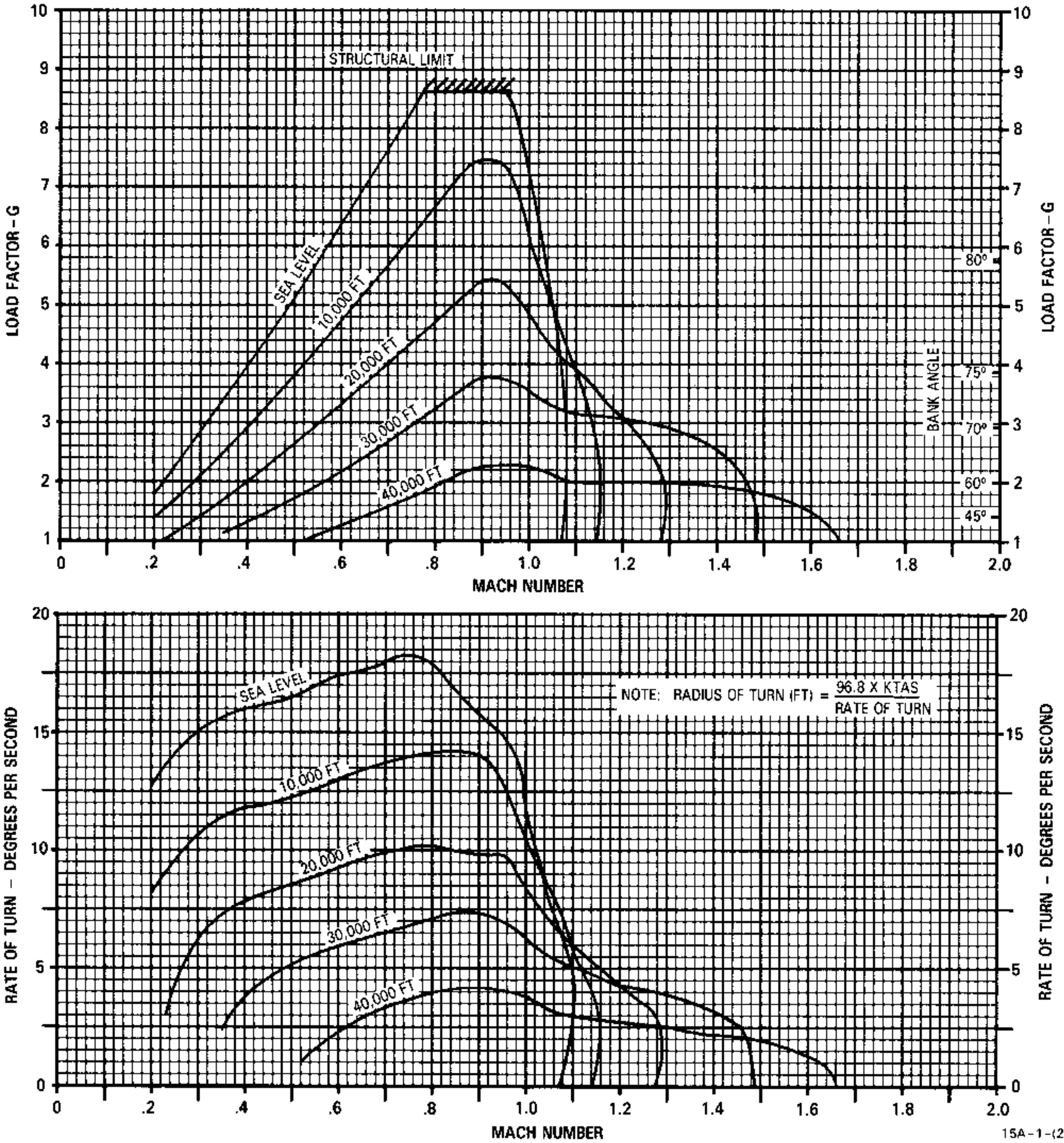
REMARKS

ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966
ENGINE TRIM: 97.7%

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

GUIDE





NOTE: RADIUS OF TURN (FT) = $\frac{96.8 \text{ X KTAS}}{\text{RATE OF TURN}}$

15A-1-(241)

Figure A9-34

SUSTAINED LEVEL TURNS

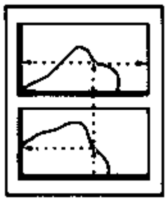
GROSS WEIGHT-41,000 POUNDS
MAXIMUM THRUST

AIRPLANE CONFIGURATION
F-15A/C
(4)AIM-7+(4)AIM-9 + ℄ TANK

REMARKS
ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966
ENGINE TRIM: 97.7%

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

GUIDE



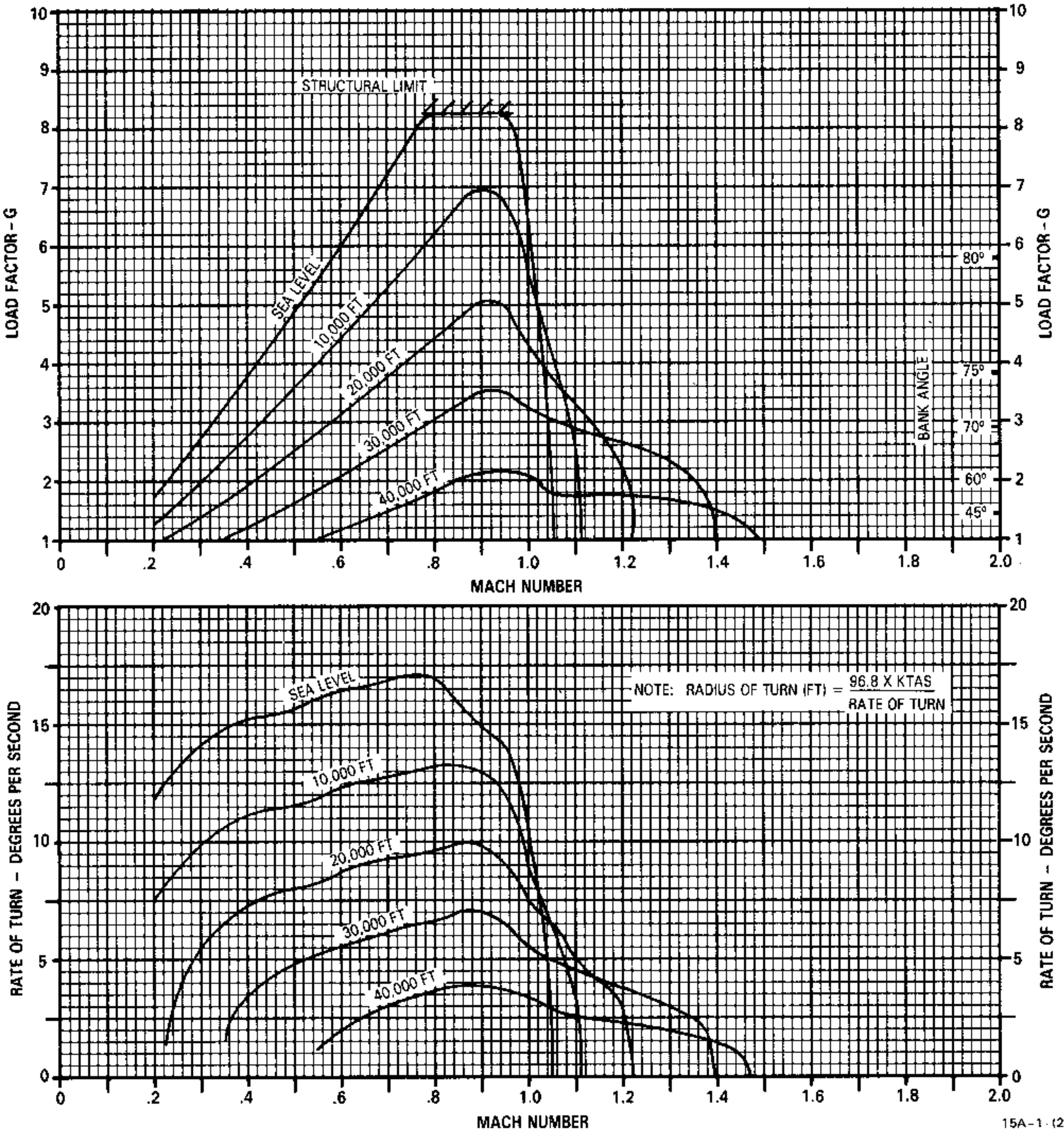


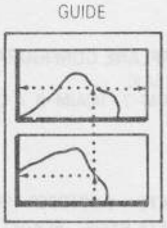
Figure A9-35

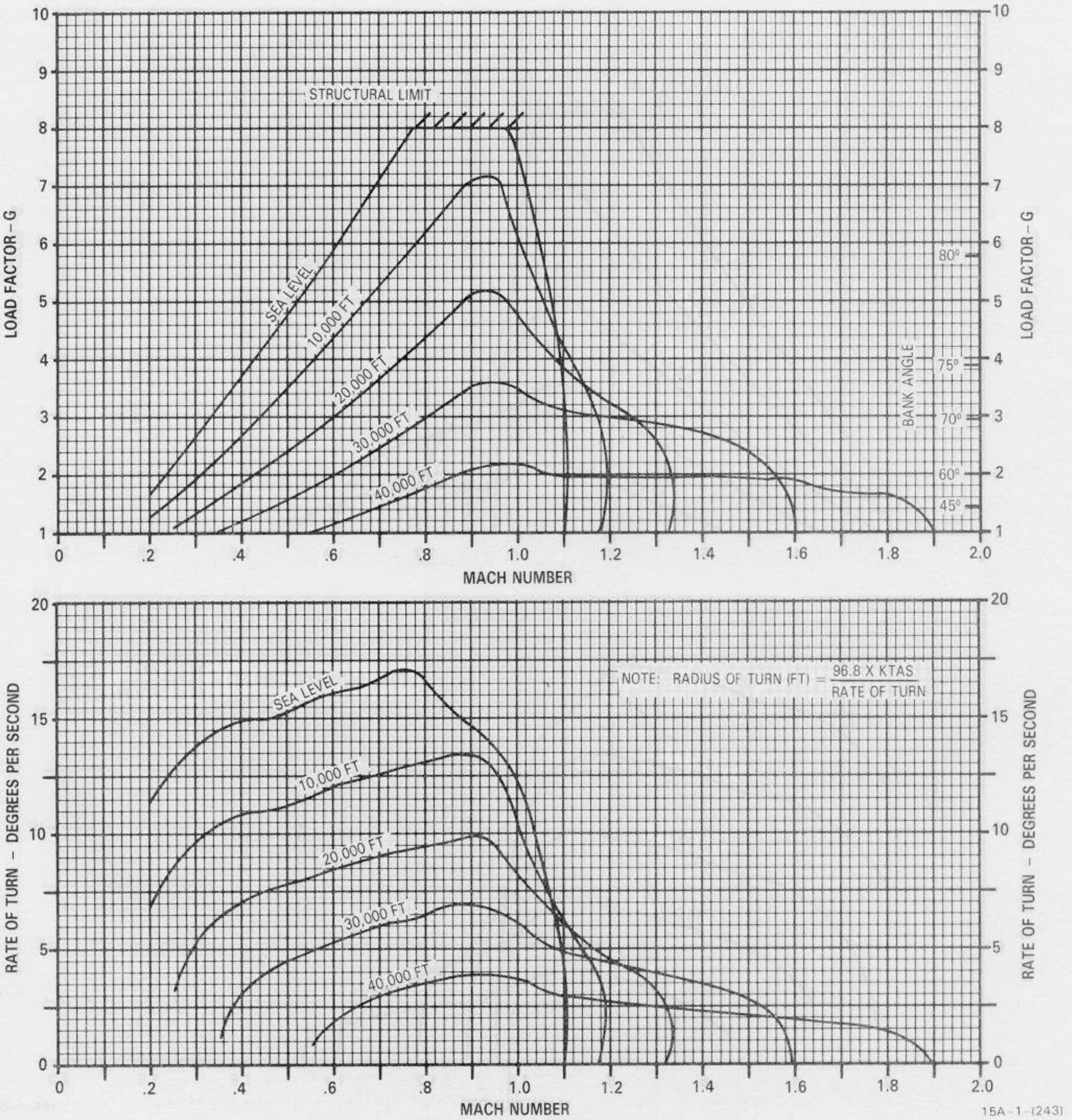
SUSTAINED LEVEL TURNS
GROSS WEIGHT-42,000 POUNDS
MAXIMUM THRUST

AIRPLANE CONFIGURATION
F-15A/C
CFT

DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

REMARKS
ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966
ENGINE TRIM: 97.7%





NOTE: RADIUS OF TURN (FT) = $\frac{96.8 \text{ X KTAS}}{\text{RATE OF TURN}}$

Figure A9-36

SUSTAINED LEVEL TURNS

GROSS WEIGHT-46,000 POUNDS
MAXIMUM THRUST

AIRPLANE CONFIGURATION

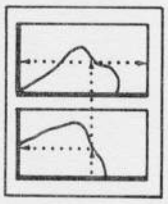
F-15A/C
CFT+(4)AIM-7+
(4)AIM-9 + ℄ PYLON

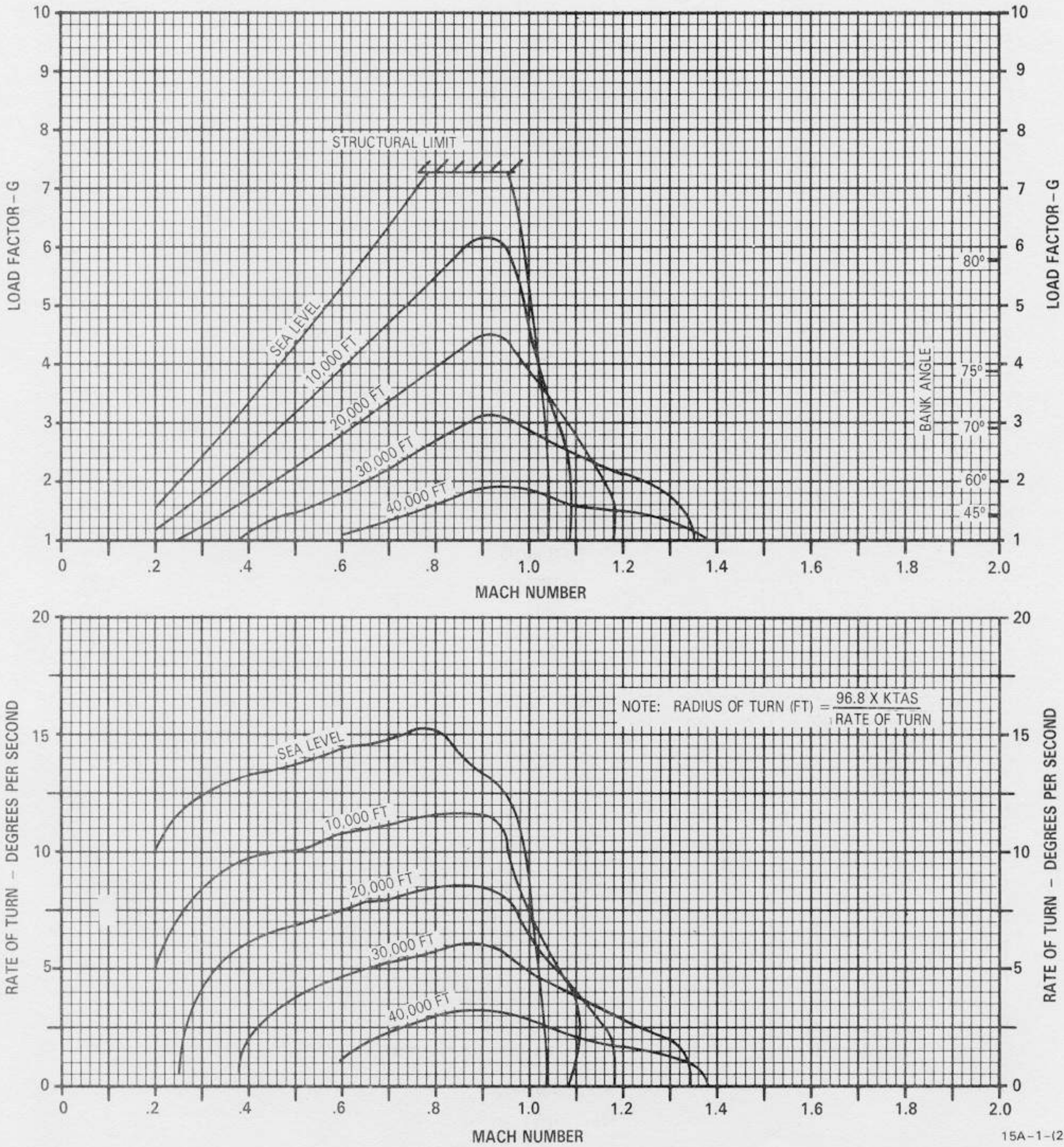
DATE: 1 OCTOBER 1985
DATA BASIS: **FLIGHT TEST**

REMARKS

ENGINE(S): (2) F100-PW-100
U.S. STANDARD DAY, 1966
ENGINE TRIM: 97.7%

GUIDE





NOTE: RADIUS OF TURN (FT) $= \frac{96.8 \text{ X KTAS}}{\text{RATE OF TURN}}$

15A-1-(244)

Figure A9-37

FOLDOUT ILLUSTRATIONS

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General Arrangement FO-3
Cockpit FO-5
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Airplane and Engine Fuel System............. FO-9
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GENERAL ARRANGEMENT

NOTE

The F–15C/D internal fuel tanks are shown. The F–15A/B internal tanks are about the same except they do not have the leading and trailing edge internal wing tanks or the number 1 auxiliary tanks.

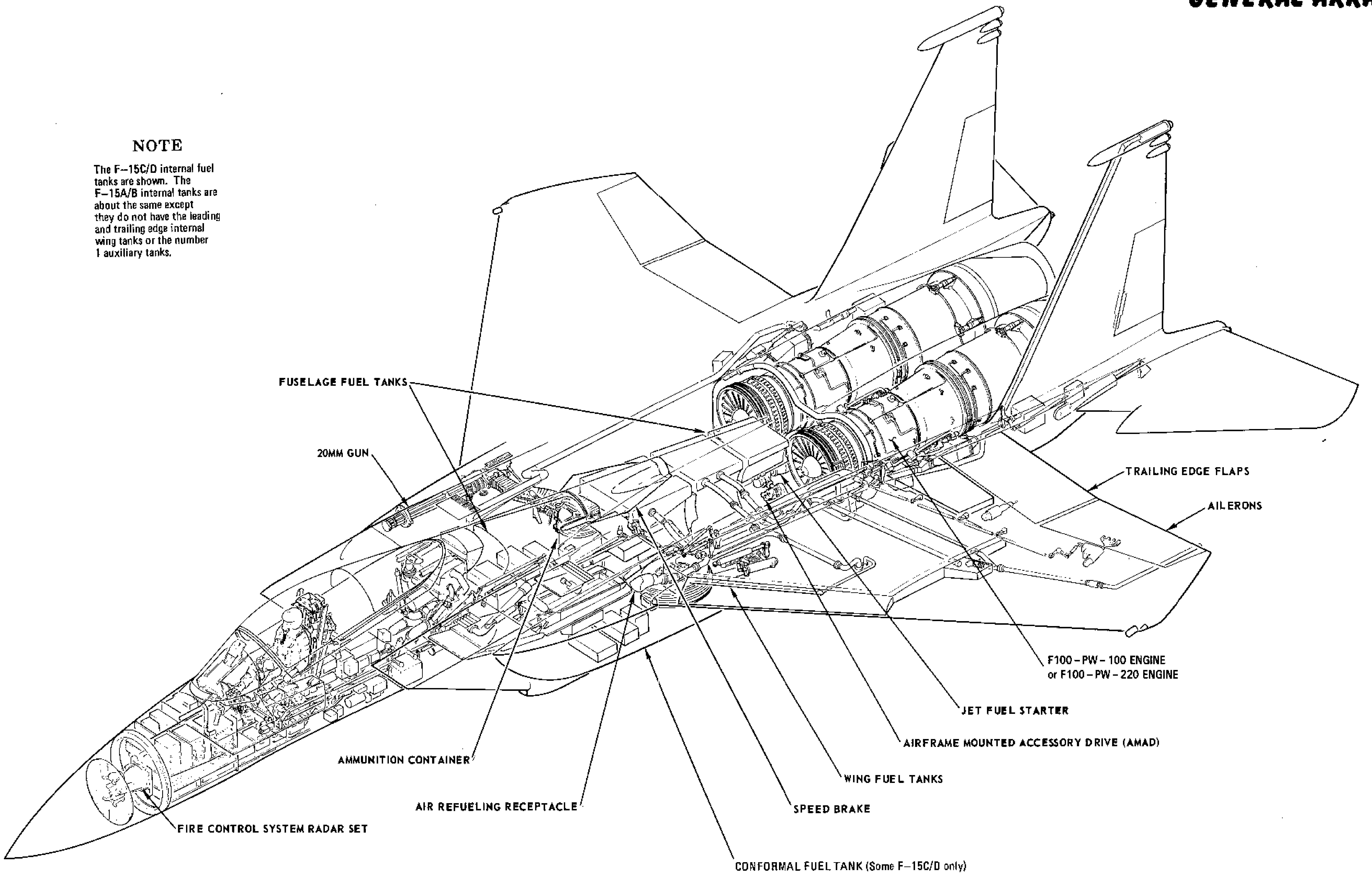


Figure FO-1

COCKPIT

F–15A, F–15B, F–15C
THRU 83–0043 AND
F–15D THRU 83–0050

TYPICAL

LEFT CONSOLE

1. ILS/TACAN CONTROL PANEL
2. CONTROL AUGMENTATION SYSTEM CONTROL PANEL
3. BLANK
4. THROTTLE QUADRANT
5. EXTERIOR LIGHTS CONTROL PANEL
6. INTEGRATED COMMUNICATIONS CONTROL PANEL
7. BLANK PANEL F–15A/C OR TAKE COMMAND/ICS CONTROL PANEL F–15B AND F–15D (THRU 79–0081); KY–58 CONTROL PANEL F–15C/D (80–0002 AND UP)
8. BLANK
9. ANTI–G PANEL
10. BOARDING STEPS POSITION INDICATOR
11. BLANK
12. ARMAMENT SAFETY OVERRIDE SWITCH
13. GROUND POWER PANEL
14. BLANK (F–15A/B/C); TAKE COMMAND/ICS CONTROL PANEL (F–15D 80–0054 AND UP)
15. EMERGENCY AIR REFUELING SWITCH/HANDLE
16. BIT PANEL
17. INTERROGATOR CONTROL PANEL
18. IFF CONTROL PANEL
19. IFF ANTENNA SELECT SWITCH
20. EWWS ENABLE SWITCH (SOME F–15A/B ALL F–15C/D)
21. TEWS PANEL
22. SEAT ADJUST SWITCH
23. RADAR CONTROL PANEL
24. VMAX SWITCH
25. FUEL CONTROL PANEL
26. MISCELLANEOUS CONTROL PANEL
27. CANOPY JETTISON HANDLE

NOTES

1 AIRCRAFT THRU 76–0142 BEFORE TO 1F–15–857.

2 AIRCRAFT 77–0061 THRU 79–0081 BEFORE TO 1F–15–857.

3 SELECTED AIRCRAFT WITH TO 1F–15–704.

MAIN PANEL

1. LOCK/SHOOT LIGHTS (SOME AIRCRAFT)
2. AIR REFUELING READY LIGHT
3. STANDBY MAGNETIC COMPASS
4. HEAD UP DISPLAY COMBINING GLASS
5. HUD VIDEO AND MICP CONTROL PANEL CAMERA
6. MASTER CAUTION LIGHT
7. MAIN COMMUNICATIONS CONTROL PANEL
8. FIRE WARNING/EXTINGUISHING PANEL
9. VERTICAL SITUATION DISPLAY (VSD)
10. HEAD UP DISPLAY CONTROL PANEL
11. VIDEO TAPE RECORDER CONTROL PANEL, AFTER TO–15–817
    GUN SIGHT CAMERA CONTROL PANEL, BEFORE TO–15–817
12. TEWS DISPLAY UNIT
13. CANOPY UNLOCKED WARNING LIGHT
14. COUNTERMEASURES DISPENSER LIGHTS (F–15C 83–0028 THRU 83–0043 AND F–15D 83–0048 THRU 83–0050)
15. HYDRAULIC PRESSURE INDICATORS
16. ENGINE TACHOMETERS
17. ALTIMETER
18. FAN TURBINE INLET TEMPERATURE INDICATORS
19. ENGINE OIL PRESSURE INDICATORS
20. FUEL QUANTITY INDICATOR
21. ENGINE FUEL FLOW INDICATORS
22. VERTICAL VELOCITY INDICATOR
23. EIGHT DAY CLOCK
24. ENGINE EXHAUST NOZZLE POSITION INDICATORS
25. JET FUEL STARTER CONTROL HANDLE
26. CABIN PRESSURE ALTIMETER
27. CAUTION LIGHTS PANEL
28. EMERGENCY VENT CONTROL HANDLE
29. CIRCUIT BREAKER PANELS
30. COCKPIT COOLING AND PRESSURIZATION OUTLET
31. STANDBY AIRSPEED INDICATOR
32. STANDBY ATTITUDE INDICATOR
33. STANDBY ALTIMETER
34. RUDDER PEDAL ADJUST RELEASE KNOB
35. MASTER MODE CONTROLS/MARKER BEACON PANEL
36. ATTITUDE DIRECTOR INDICATOR
37. EMERGENCY JETTISON BUTTON
38. STEERING MODE PANEL
39. HORIZONTAL SITUATION INDICATOR
40. EMERGENCY BRAKE/STEERING CONTROL HANDLE
41. ACCELEROMETER
42. ANGLE OF ATTACK INDICATOR
43. AIRSPEED/MACH INDICATOR
44. ARMAMENT CONTROL PANEL
45. PITCH RATIO INDICATOR
46. PITCH RATIO SELECT SWITCH
47. LANDING GEAR CONTROL HANDLE
48. RADIO CALL PANEL
49. FLAP POSITION INDICATOR
50. EMERGENCY LANDING GEAR HANDLE
51. ARRESTING HOOK CONTROL SWITCH

RIGHT CONSOLE

1. OXYGEN REGULATOR
2. ECS PANEL
3. TEMPERATURE PANEL
4. CANOPY CONTROL HANDLE
5. INTERIOR LIGHTS CONTROL PANEL
6. TEWS POD CONTROL PANEL
7. OXYGEN HOSE STOWAGE FITTING
8. COUNTERMEASURES DISPENSER (CMD) CONTROL PANEL (F–15C 83–0028 THRU 83–0043 AND F–15D 83–0048 THRU 83–0050)
9. BLANK
10. ENGINE START FUEL SWITCHES
11. UTILITY LIGHT
12. STOWAGE COMPARTMENT OXYGEN/COMMUNICATION
13. OUTLET PANEL
14. COMPASS CONTROL PANEL
15. TEWS POWER CONTROL PANEL
16. NAVIGATION CONTROL PANEL ENGINE CONTROL PANEL

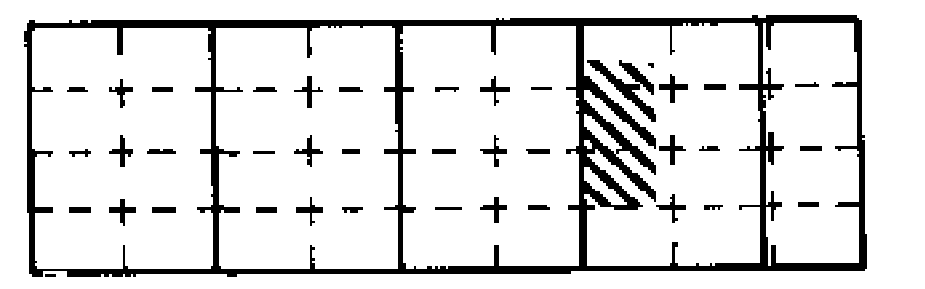
15A–1–(19–1)

Figure FO-2

COCKPIT

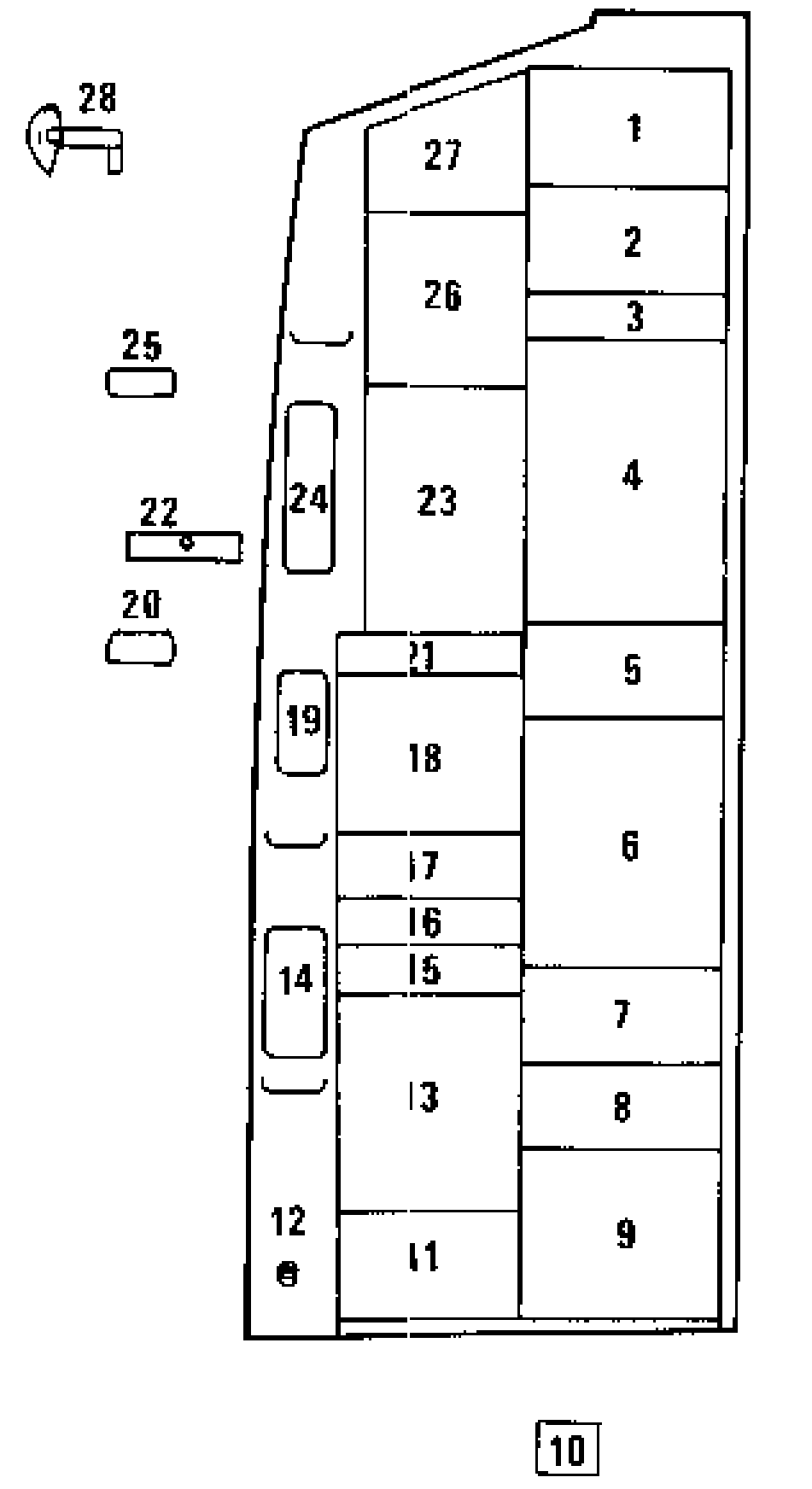
F–15C 84–0001 AND UP;
F–15D 84–0042 AND UP.

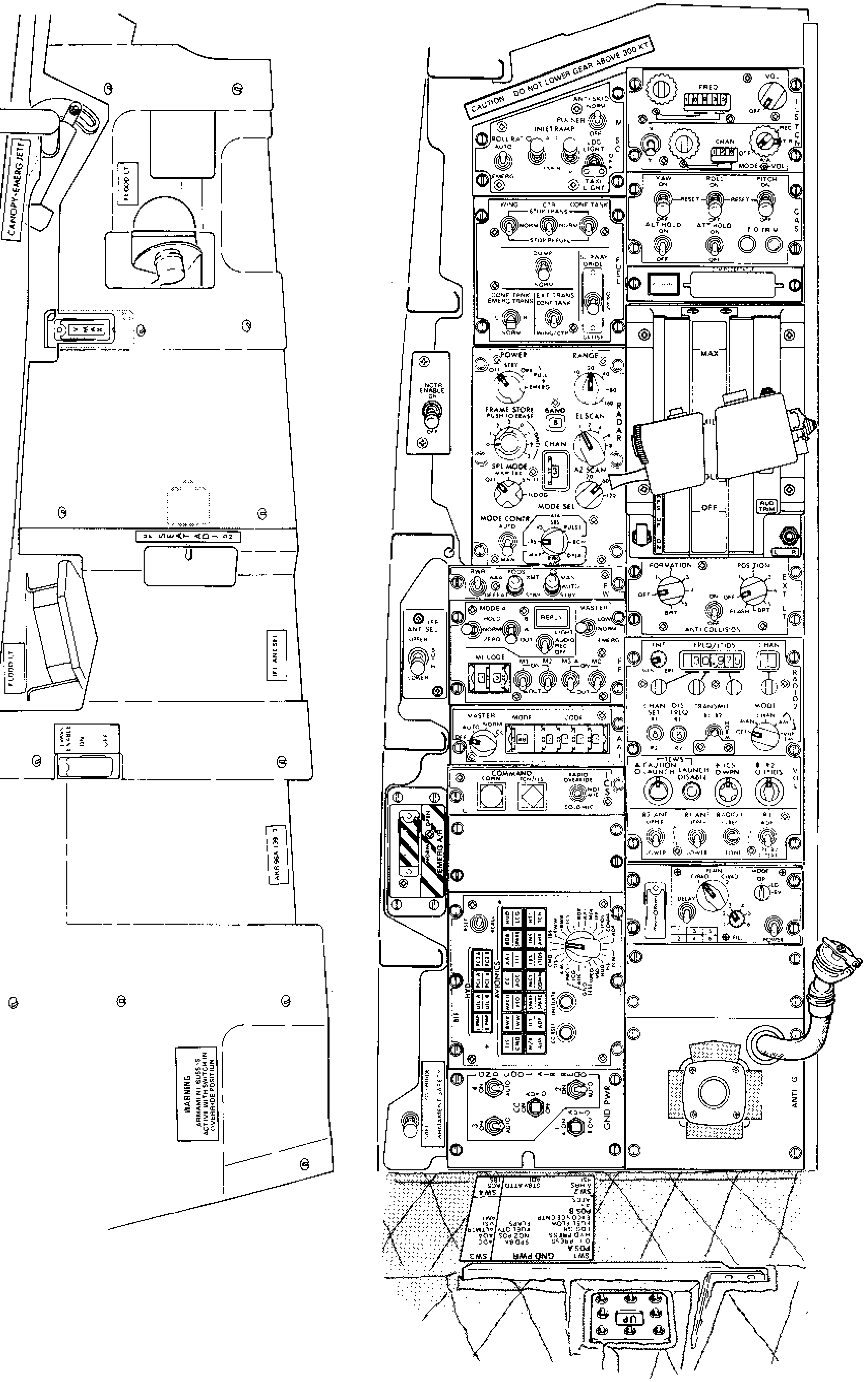
TYPICAL

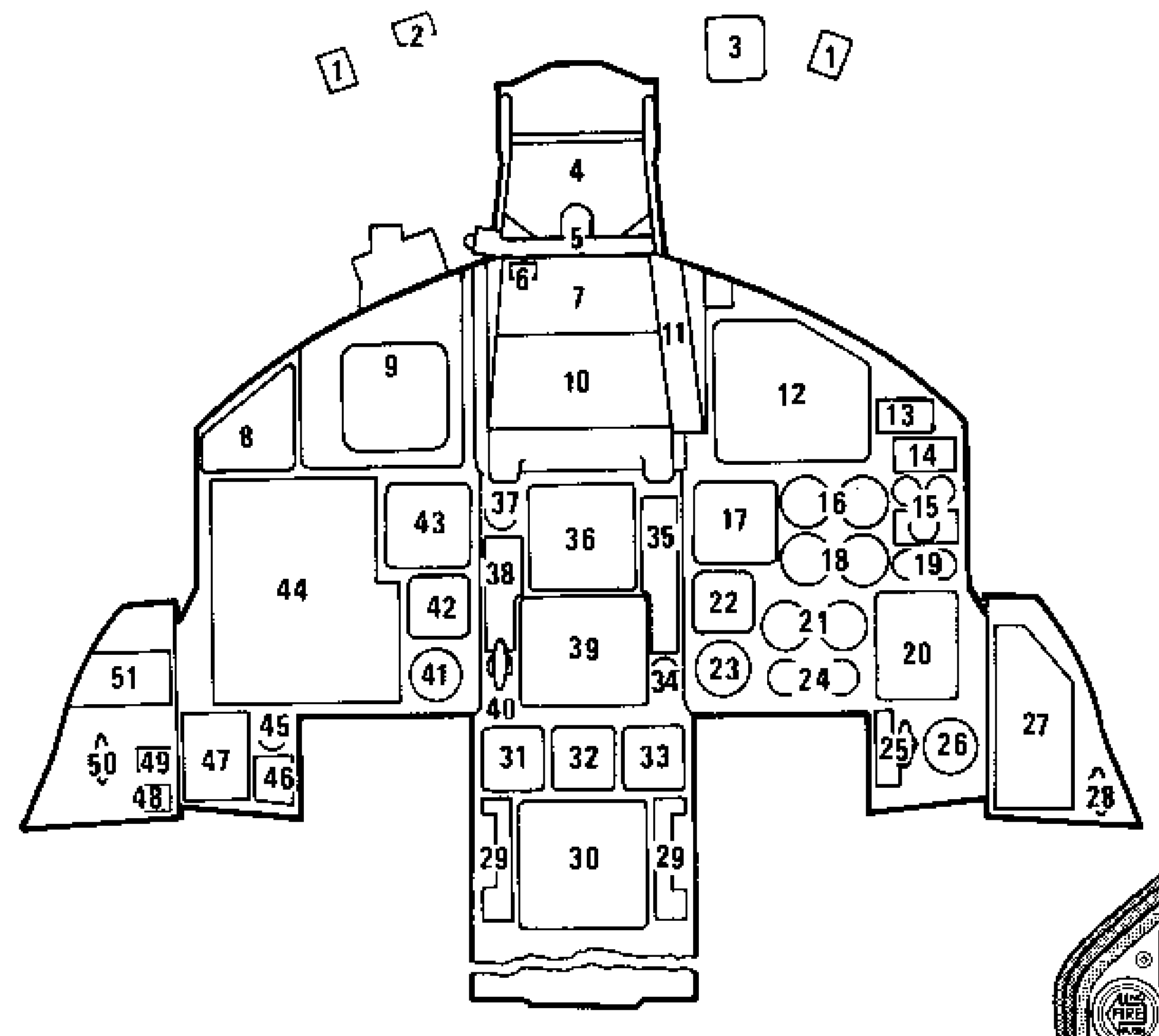


LEFT CONSOLE

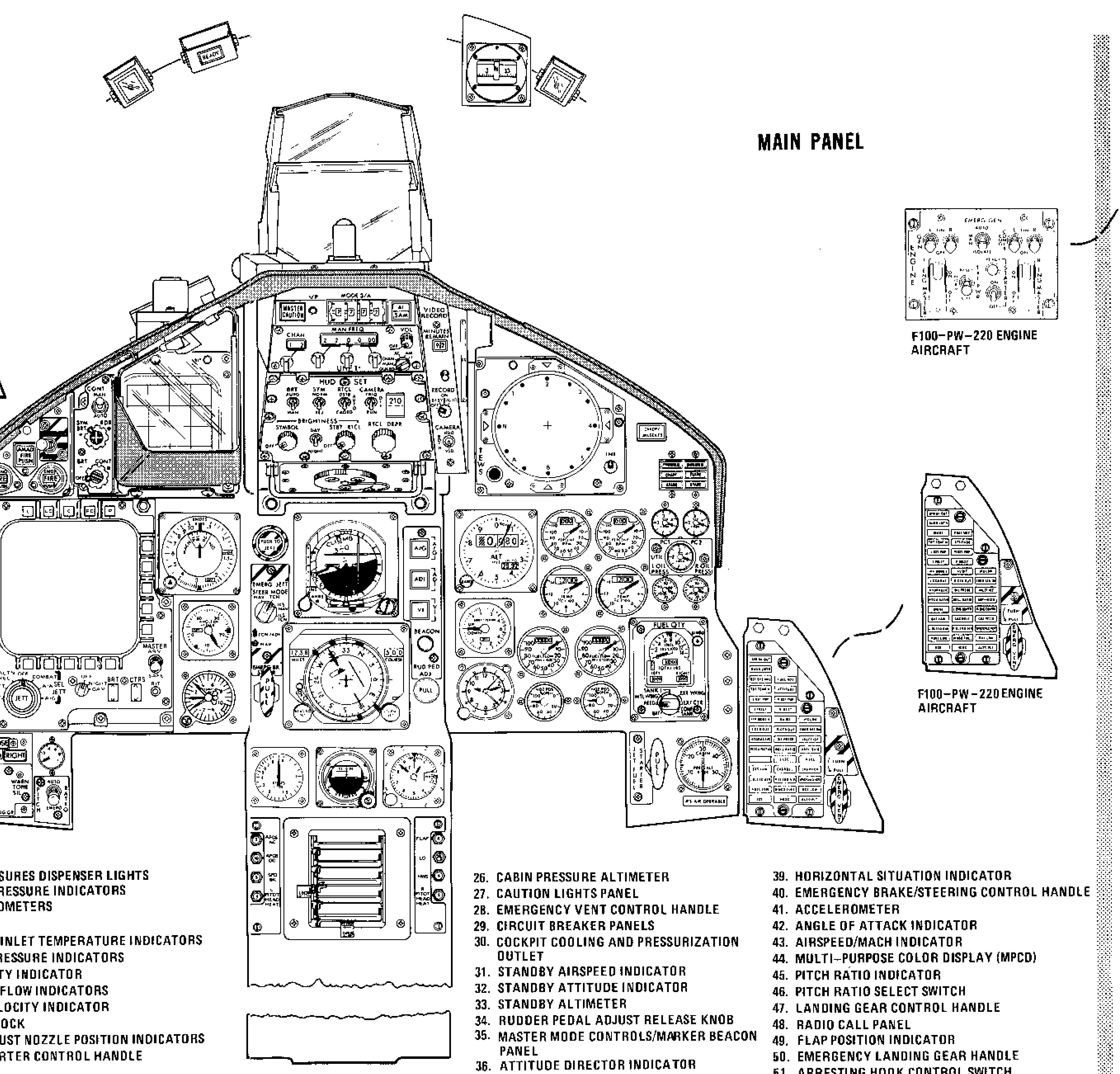
1. ILS/TACAN CONTROL PANEL
2. CONTROL AUGMENTATION SYSTEM CONTROL PANEL
3. DATA TRANSFER MODULE RECEPTACLE
4. THROTTLE QUADRANT
5. EXTERIOR LIGHTS CONTROL PANEL
6. INTEGRATED COMMUNICATIONS CONTROL PANEL
7. KY–58 CONTROL PANEL
8. BLANK
9. ANTI–G PANEL
10. BOARDING STEPS POSITION INDICATOR PANEL
11. GROUND POWER PANEL
12. ARMAMENT SAFETY OVERRIDE SWITCH
13. BIT PANEL
14. EMERGENCY AIR REFUELING SWITCH
15. BLANK
16. BLANK (F–15C); TAKE COMMAND/ICS CONTROL PANEL (F–15D)
17. INTERROGATOR CONTROL PANEL
18. IFF CONTROL PANEL
19. IFF ANTENNA SELECT SWITCH
20. EWWS ENABLE SWITCH
21. TEWS PANEL
22. SEAT ADJUST SWITCH
23. RADAR CONTROL PANEL
24. NON–COOPERATIVE TARGET RECOGNITION (NCTR) ENABLE SWITCH
25. VMAX SWITCH
26. FUEL CONTROL PANEL
27. MISCELLANEOUS CONTROL PANEL
28. CANOPY JETTISON HANDLE





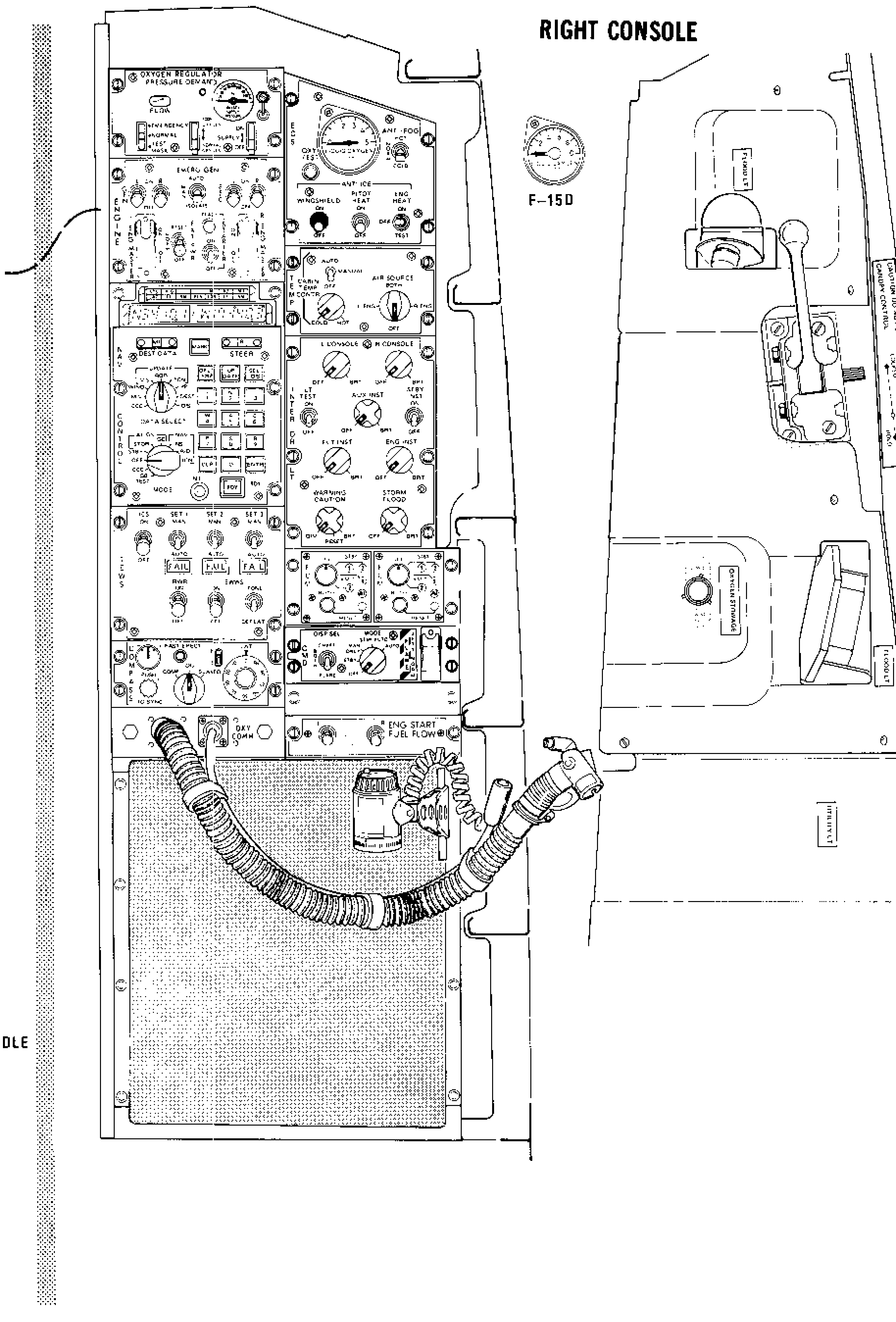


MAIN PANEL

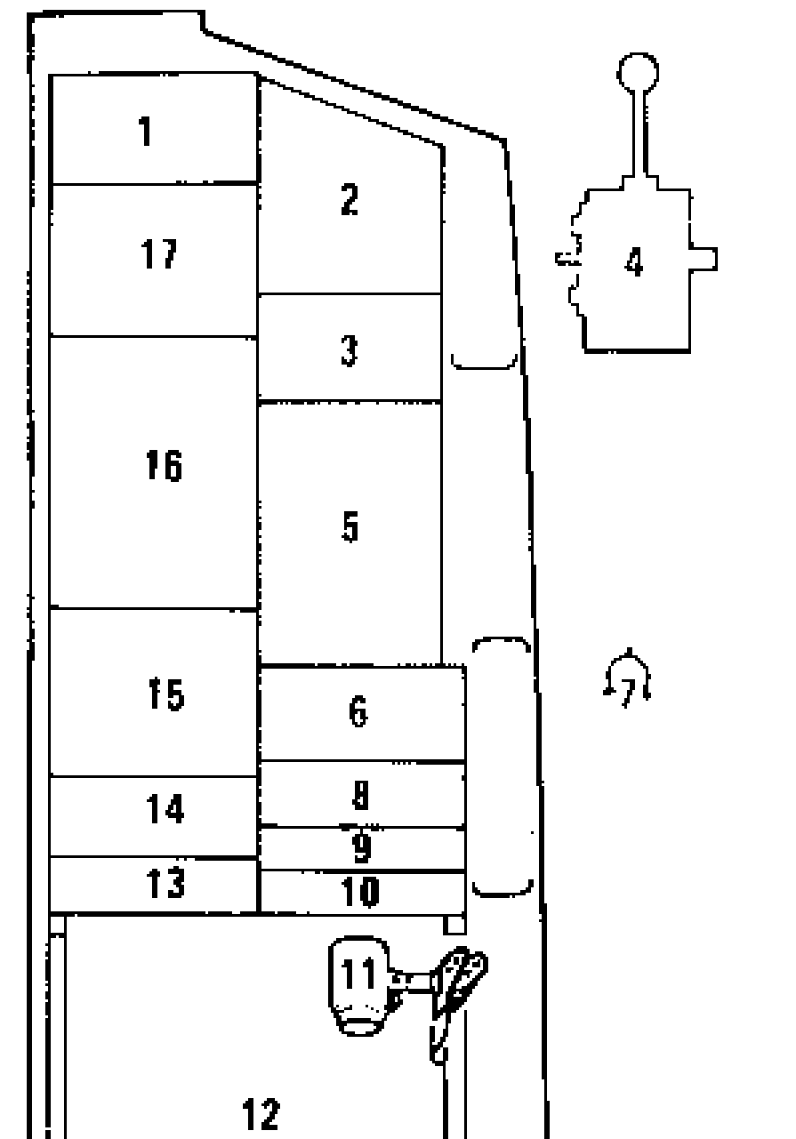


1. LOCK/SHOOT LIGHTS
2. AIR REFUELING READY LIGHT
3. STANDBY MAGNETIC COMPASS
4. HEAD UP DISPLAY COMBINING GLASS
5. HUD VIDEO AND MICP CONTROL PANEL CAMERA
6. MASTER CAUTION LIGHT
7. MAIN COMMUNICATIONS CONTROL PANEL
8. FIRE WARNING/EXTINGUISHING PANEL
9. VERTICAL SITUATION DISPLAY (VSD)
10. HEAD UP DISPLAY CONTROL PANEL
11. VIDEO TAPE RECORDER CONTROL PANEL
12. TEWS DISPLAY UNIT
13. CANOPY UNLOCKED WARNING LIGHT
14. COUNTERMEASURES DISPENSER LIGHTS
15. HYDRAULIC PRESSURE INDICATORS
16. ENGINE TACHOMETERS
17. ALTIMETER
18. FAN TURBINE INLET TEMPERATURE INDICATORS
19. ENGINE OIL PRESSURE INDICATORS
20. FUEL QUANTITY INDICATOR
21. ENGINE FUEL FLOW INDICATORS
22. VERTICAL VELOCITY INDICATOR
23. EIGHT DAY CLOCK
24. ENGINE EXHAUST NOZZLE POSITION INDICATORS
25. JET FUEL STARTER CONTROL HANDLE
26. CABIN PRESSURE ALTIMETER
27. CAUTION LIGHTS PANEL
28. EMERGENCY VENT CONTROL HANDLE
29. CIRCUIT BREAKER PANELS
30. COCKPIT COOLING AND PRESSURIZATION OUTLET
31. STANDBY AIRSPEED INDICATOR
32. STANDBY ATTITUDE INDICATOR
33. STANDBY ALTIMETER
34. RUDDER PEDAL ADJUST RELEASE KNOB
35. MASTER MODE CONTROLS/MARKER BEACON PANEL
36. ATTITUDE DIRECTOR INDICATOR
37. EMERGENCY JETTISON BUTTON
38. STEERING MODE PANEL
39. HORIZONTAL SITUATION INDICATOR
40. EMERGENCY BRAKE/STEERING CONTROL HANDLE
41. ACCELEROMETER
42. ANGLE OF ATTACK INDICATOR
43. AIRSPEED/MACH INDICATOR
44. MULTI–PURPOSE COLOR DISPLAY (MPCD)
45. PITCH RATIO INDICATOR
46. PITCH RATIO SELECT SWITCH
47. LANDING GEAR CONTROL HANDLE
48. RADIO CALL PANEL
49. FLAP POSITION INDICATOR
50. EMERGENCY LANDING GEAR HANDLE
51. ARRESTING HOOK CONTROL SWITCH

RIGHT CONSOLE



1. OXYGEN REGULATOR
2. ECS PANEL
3. TEMPERATURE PANEL
4. CANOPY CONTROL HANDLE
5. INTERIOR LIGHTS CONTROL PANEL
6. TEWS POD CONTROL PANEL
7. OXYGEN HOSE STOWAGE FITTING
8. COUNTERMEASURES DISPENSER (CMD) CONTROL PANEL
9. BLANK
10. ENGINE START FUEL SWITCHES
11. UTILITY LIGHT
12. STOWAGE COMPARTMENT OXYGEN/COMMUNICATION
13. OUTLET PANEL
14. COMPASS CONTROL PANEL
15. TEWS POWER CONTROL PANEL
16. NAVIGATION CONTROL PANEL
17. ENGINE CONTROL PANEL



15A-1-(19-2)Y

Figure FO-2

REAR COCKPIT F-15B/D

TYPICAL

LEFT CONSOLE

1. ILS/TACAN CONTROL PANEL
2. TAKE COMMAND/ICS CONTROL PANEL
3. BLANK PANEL
4. THROTTLE QUADRANT
5. INTEGRATED COMMUNICATIONS CONTROL PANEL
6. BLANK PANEL
7. BLANK PANEL
8. ANTI-G PANEL
9. BLANK PANEL
10. BLANK PANEL
11. STOWAGE COMPARTMENT
12. CIRCUIT BREAKER PANEL
13. BLANK PANEL
14. SEAT ADJUST SWITCH
15. BLANK PANEL
16. BLANK PANEL
17. BLANK PANEL
18. BLANK PANEL
19. BLANK PANEL

MAIN PANEL

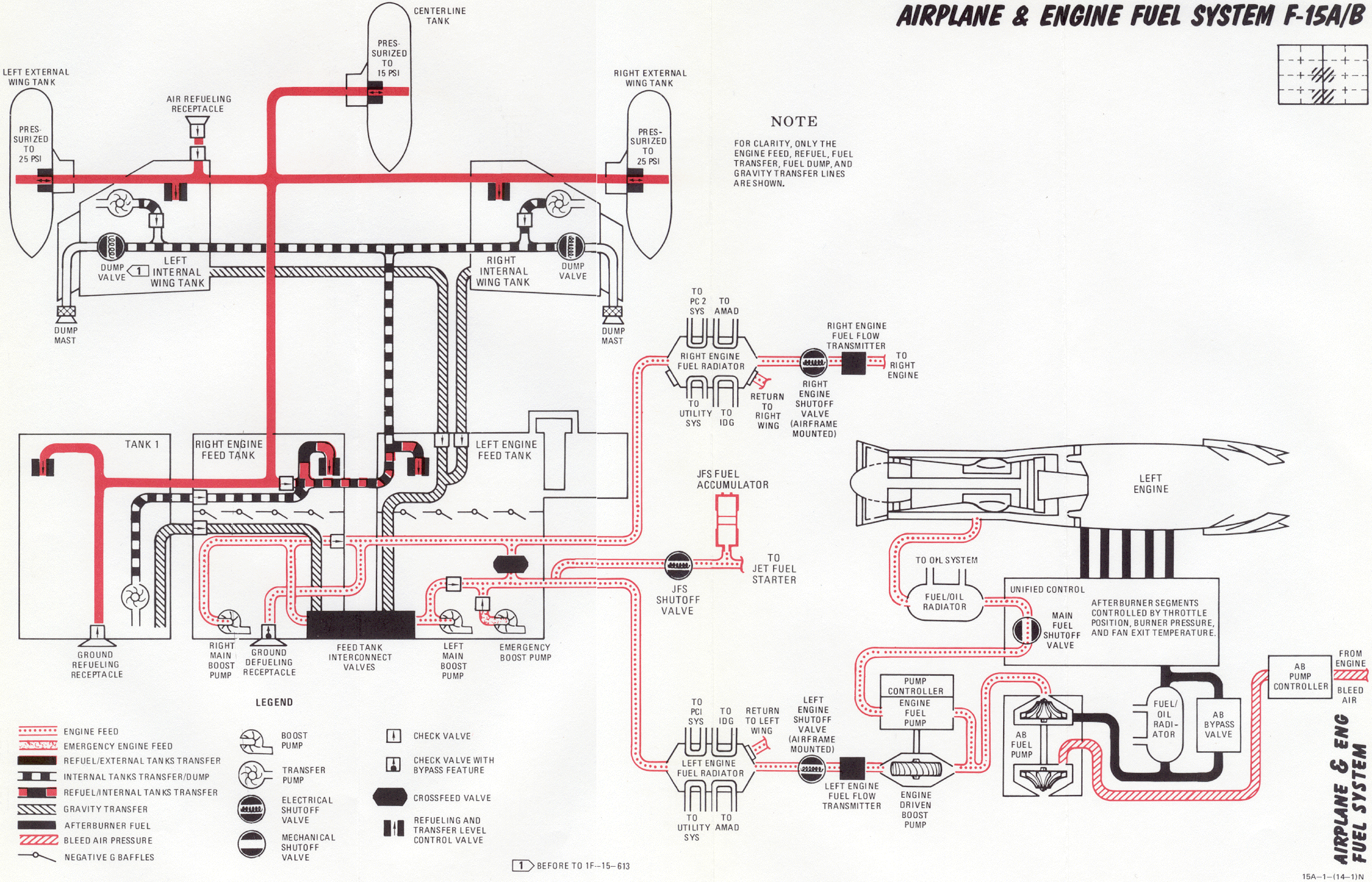
1. FIRE WARNING LIGHTS
2. VERTICAL SITUATION DISPLAY (VSD)
3. HAND HOLD
4. MASTER CAUTION LIGHT
5. MAIN COMMUNICATIONS CONTROL PANEL
6. CANOPY UNLOCKED WARNING LIGHT
7. CAUTION LIGHTS PANEL
8. ENGINE OIL PRESSURE INDICATORS
9. ENGINE TACHOMETERS
10. ALTIMETER
11. FAN TURBINE INLET TEMPERATURE INDICATORS
12. FUEL QUANTITY INDICATOR (REPEATER)
13. ENGINE FUEL FLOW INDICATORS
14. VERTICAL VELOCITY INDICATOR
15. EIGHT DAY CLOCK
16. ENGINE EXHAUST NOZZLE POSITION INDICATORS
17. CABIN PRESSURE ALTIMETER
18. COMMAND SELECTOR VALVE HANDLE
19. COCKPIT COOLING AND PRESSURIZATION OUTLET
20. RUDDER PEDAL ADJUST RELEASE KNOB
21. MASTER MODE CONTROLS/MARKER BEACON PANEL
22. ATTITUDE DIRECTOR INDICATOR
23. HORIZONTAL SITUATION INDICATOR
24. EMERGENCY BRAKE/STEERING CONTROL HANDLE
25. ACCELEROMETER
26. ANGLE OF ATTACK INDICATOR
27. AIRSPEED/MACH INDICATOR
28. LANDING GEAR POSITION INDICATORS
29. FLAP POSITION INDICATORS
30. EMERGENCY LANDING GEAR HANDLE
31. ARRESTING HOOK CONTROL SWITCH
32. CANOPY JETTISON HANDLE

RIGHT CONSOLE

1. OXYGEN REGULATOR
2. ECS PANEL
3. CANOPY CONTROL HANDLE
4. INTERIOR LIGHTS CONTROL PANEL
5. BLANK PANEL
6. BLANK PANEL
7. BLANK PANEL
8. OXYGEN HOSE STOWAGE FITTING
9. UTILITY LIGHT
10. CIRCUIT BREAKER PANEL (F-15D ONLY)
11. BLANK PANEL
12. BLANK PANEL
13. BLANK PANEL
14. OXYGEN/COMMUNICATION OUTLET PANEL
15. BLANK PANEL
16. SKID CONTROLLER INSPECTION WINDOW
17. BLANK PANEL

Figure FO-3

AIRPLANE & ENGINE FUEL SYSTEM F-15A/B



NOTE

FOR CLARITY, ONLY THE ENGINE FEED, REFUEL, FUEL TRANSFER, FUEL DUMP, AND GRAVITY TRANSFER LINES ARE SHOWN.

Figure FO-4 (Sheet 1 of 2)

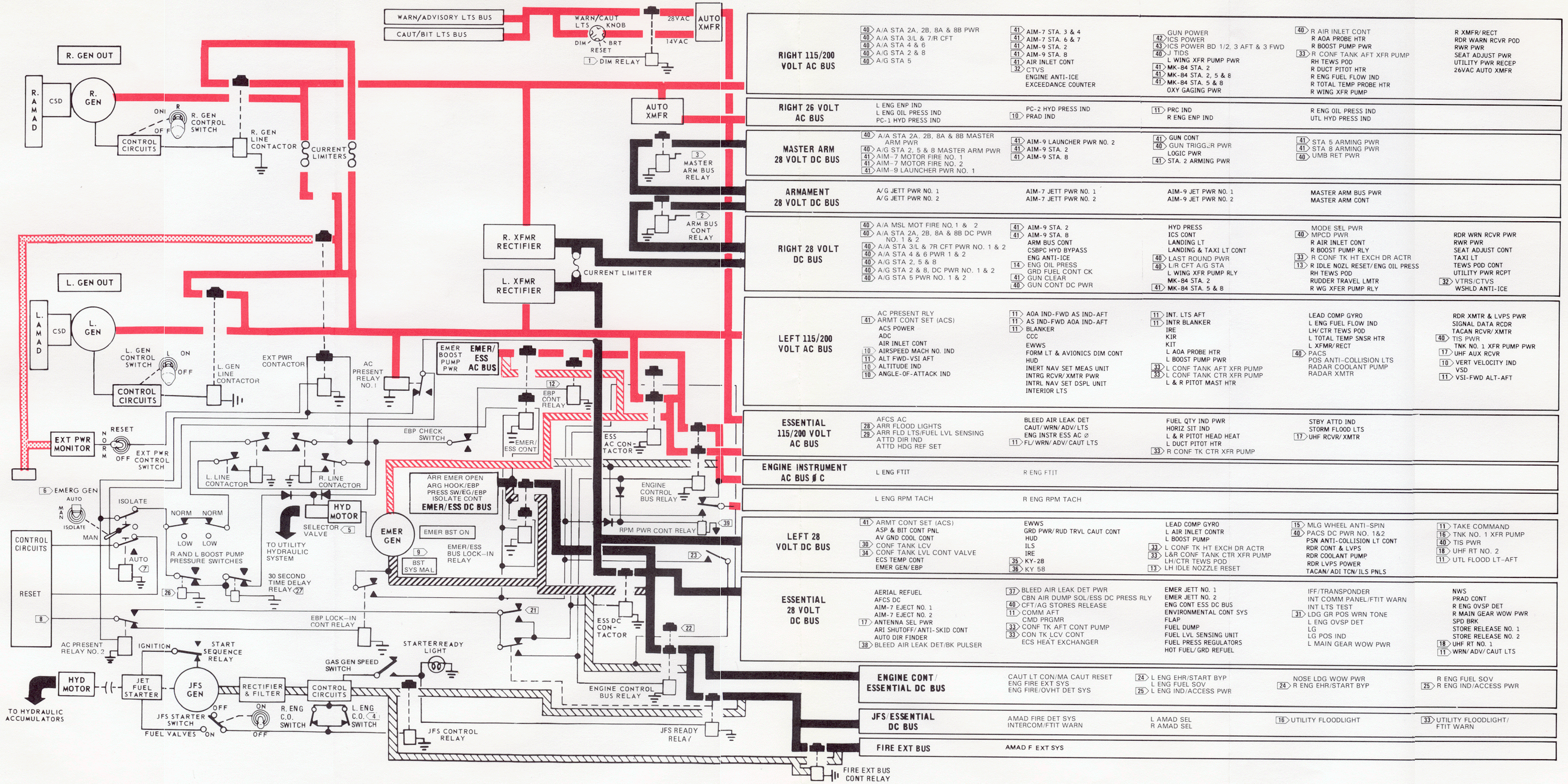
AIRPLANE & ENGINE FUEL SYSTEM F-15C/D

NOTE

- FOR CLARITY, ONLY THE ENGINE FEED, REFUEL, FUEL TRANSFER, FUEL DUMP, AND GRAVITY TRANSFER LINES ARE SHOWN.
- TO MAINTAIN CG DURING INFLIGHT REFUELING, THE AFT CFT REFUEL CONTROL VALVE REMAINS CLOSED UNTIL THE FORWARD AND CENTER COMPARTMENTS ARE APPROXIMATELY 1/3 FULL.

Figure FO-4 (Sheet 2)

ELECTRICAL SYSTEM
EXTERNAL POWER APPLIED



1. DIMMING RELAY ENERGIZED WITH FLIGHT INSTRUMENT LIGHTS KNOB ON AND WARNING/CAUTION LIGHTS KNOB MOVED TEMPORARILY TO RESET. RELAY IS DEENERGIZED BY TURNING FLIGHT INSTRUMENTS LIGHT OFF OR TURNING STORM/FLOODS KNOB TO FULL BRIGHT. OPERATION TYPICAL FOR F–15A/C AIRCRAFT AND BOTH COCKPITS OF F–15B/D AIRCRAFT.

2. ARMAMENT BUS CONTROL RELAY ENERGIZED WITH GEAR HANDLE UP. WITH GEAR HANDLE DOWN, RELAY IS ENERGIZED BY PLACING ARMAMENT SAFETY OVERRIDE SWITCH TO OVERRIDE POSITION.

3. MASTER ARM BUS RELAY IS ENERGIZED WITH THE MASTER ARM SWITCH IN THE ARM POSITION, PROVIDING ARMAMENT BUS IS ENERGIZED.

4. ENGINE CUTOUT SWITCHES OPEN AFTER THEIR RESPECTIVE ENGINES START.

5. WITH ELECTRICAL POWER AT SELECTOR VALVE, HYDRAULIC POWER IS SHUT OFF FROM EMERGENCY GENERATOR (EG) TO PREVENT OPERATION.

6. EMERGENCY GENERATOR CONTROL SWITCH SHOWN IN AUTO POSITION WITH EXTERNAL POWER APPLIED. THE EG IS PREVENTED FROM OPERATING BY A CONTACT OF THE EXT PWR CONT RELAY ENERGIZING THE EG SELECTOR VALVE. DURING NORMAL FLIGHT CONDITIONS WITH THE SWITCH IN AUTO, THE EG WILL OPERATE IF ONE OR MORE OF THE FOLLOWING CONDITIONS OCCUR: A MAIN GENERATOR GOES OFF THE LINE OR A MAIN FUEL BOOST PUMP LOSES PRESSURE. POSITIONING THE SWITCH TO MANUAL CAUSES THE EG TO OPERATE. POSITIONING THE SWITCH TO ISOLATE AFTER THE EG HAS OPERATED IN THE MANUAL (OR AUTO) POSITION CAUSES THE EG TO POWER ONLY THE EMER/ESS BUSES (EMERGENCY BOOST PUMP (EBP), ARRESTING HOOK AND EMERGENCY AIR REFUELING SWITCH). THIS IS ACCOMPLISHED THRU THE LOCK–IN ACTION OF THE EMER/ESS BUS LOCK–IN RELAY.

7. ISOLATE POSITION IS ELECTRICALLY HELD THRU LOCK–IN ACTION OF THE EMER/ESS CONTACTOR.

8. CONTROL SIGNAL AVAILABLE AT THIS POINT WITH EMERGENCY GENERATOR OPERATING AND GENERATING POWER OF CORRECT VOLTAGE/FREQUENCY, PROVIDED CONTROL SWITCH IS OUT OF ISOLATE POSITION.

9. THE FOLLOWING ELECTRICAL SYSTEM LOGIC APPLIES TO EMER BST ON AND BST SYS MAL LIGHTS:
   (1) EMER BST ON LIGHT ON AND BST SYS MAL LIGHT OFF – EMERGENCY GENERATOR ACTIVATED AND ELECTRICAL LOCK–UP CIRCUIT NORMAL.
   (2) EMER BST ON LIGHT OFF AND BST SYS MAL LIGHT ON–EMERGENCY GENERATOR EMERGENCY FUEL BOOST PUMP FAILED.
   (3) EMER BST ON LIGHT ON AND BST SYS MAL LIGHT ON – EMERGENCY FUEL BOOST PUMP OUTPUT PRESSURE NORMAL, BUT IS NOT BEING POWERED BY THE EMERGENCY GENERATOR. DO NOT PLACE THE EMERGENCY GENERATOR SWITCH TO ISOLATE.

10. F–15A/C AIRCRAFT ONLY.

11. F–15B/D AIRCRAFT ONLY.

12. EBP CONTROL RELAY ENERGIZES TO PREVENT OPERATION OF THE EBP WHENEVER POWER IS PRESENT AT SELECTOR VALVE OF EG TO PREVENT EG OPERATION. THE EBP CAN BE OPERATED UNDER THIS CONDITION BY ACTUATING THE EBP CHECK SWITCH. AFTER TO 1F–15–764, FOR ENGINE START WITHOUT EXTERNAL POWER, RELAY REMAINS DE–ENERGIZED AFTER EG IS SHUTDOWN 30 SECONDS AFTER FIRST GENERATOR COMES ON LINE, SO THAT RESULTING OPERATION OF EBP CAUSES BST SYS MAL LIGHT TO COME ON AND EMER BST ON LIGHT TO REMAIN ON UNTIL SECOND GENERATOR COMES ON LINE.

13. F–15A, F–15C 78–0468 THRU 84–0027; F–15B, F–15D 78–0561 THRU 84–0046

14. F–15C 84–0028 AND UP; F–15D 85–0129 AND UP

15. F–15A 73–085 THRU 73–097, F–15B 73–108 THRU 73–112.

16. F–15A/B

17. F–15A 73–085 THRU 76–0120, F–15B 73–108 THRU 76–0142 BEFORE TO 1F–15–857

18. F–15A 77–0061 AND UP. F–15B 77–0154 AND UP, AND ALL OTHERS AFTER TO 1F–15–857

19. DELETED

20. DELETED

21. CONTACT IS CLOSED (DUE TO OPERATION OF WEIGHT ON WHEELS RELAY) WHILE AIRBORNE TO ENSURE EG POWERS ALL ESSENTIAL BUSES DURING INFLIGHT OPERATION OF THE JFS WITH BOTH MAIN GENERATORS OFF THE LINE.

22. WHILE AIRBORNE WITH BOTH MAIN GENERATORS OFF THE LINE AND JFS AND EG OPERATING, ENERGIZED CONTACT OF ENGINE CONTROL BUS RELAY ENERGIZES EMER/ESS CONT AND EMER/ESS BUS LOCK–IN RELAYS TO CONNECT OUTPUT OF THE EG TO THE EMER/ESS BUSES (WHICH CAUSES OPERATION OF THE EMER BOOST PUMP).

23. CONTACT IS CLOSED WHILE AIRBORNE. CONTACT IS OPEN ON THE GROUND TO PREVENT OPERATION OF THE EMER BOOST PUMP.

24. F–15A 73–085 THRU 76–0083, F–15B 73–108 THRU 76–0135

25. F–15A 76–0084 THRU 77–0153, F–15C; F–15B 76–0136 THRU 77–016, F–15D

26. AFTER TO 1F–15–764, RELAY ENERGIZED ON GROUND BY WEIGHT ON WHEELS CIRCUIT.

27. AFTER TO 1F–15–764, WITH AIRCRAFT ON GROUND, RELAY CLOSES 30 SECONDS AFTER FIRST GENERATOR COMES ON LINE, PROVIDING EMERGENCY GENERATOR SWITCH IS IN AUTO DURING A START WITHOUT EXTERNAL POWER.

28. BEFORE TO 1F–15–753.

29. AFTER TO 1F–15–753.

30. F–15D

31. AFTER TO 1F-15A-791.

32. AFTER TO 1F–15–817

33. F–15C/D

34. F–15C

35. F–15C 78–0468 THRU 79–0081, F–15A BEFORE TO 1F–15–857
    F–15D 78–0561 THRU 79–0014, F–15B BEFORE TO 1F–15–857

36. F–15C 80–0002 AND UP, AND ALL OTHERS AFTER TO 1F–15–857
    F–15D 80–0054 AND UP, AND ALL OTHERS AFTER TO 1F–15–857

37. BEFORE TO 1F–15–763.

38. AFTER TO 1F–15–763.

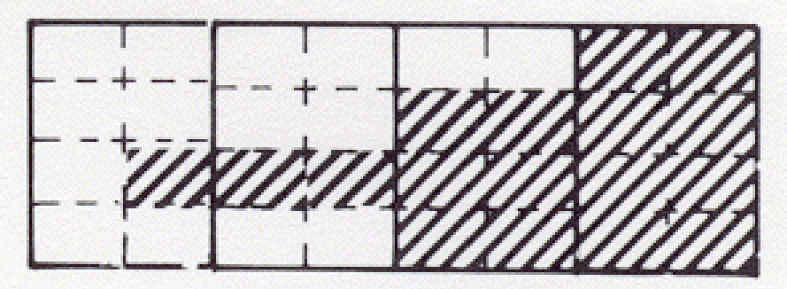
39. F–15C 83–0035 AND UP, F–15D 83–0049 AND UP, RPM POWER CONTROL RELAY ENERGIZES DURING EG OPERATION (WITH EG SWITCH IN AUTO, MAN OR ISOLATE) TO POWER THE RPM INDICATORS FROM THE EG.

40. F–15C 84–001 AND UP, F–15D 84–0042 AND UP.

41. F–15A, F–15C 78–0468 THRU 83–0043, F–15B, F–15D 78–0561 THRU 83–0050.

42. F–15A, F–15C 78–0468 THRU 83–0027.

43. F–15C 83–0028 AND UP.



LEGEND

🟥	AC POWER	▧	START POWER
■	DC POWER	—	CONTROL POWER
▦	EXTERNAL AC POWER	— — —	MECHANICAL CONNECTION
▧	EMERG AC POWER		
▨	EMERG DC POWER		

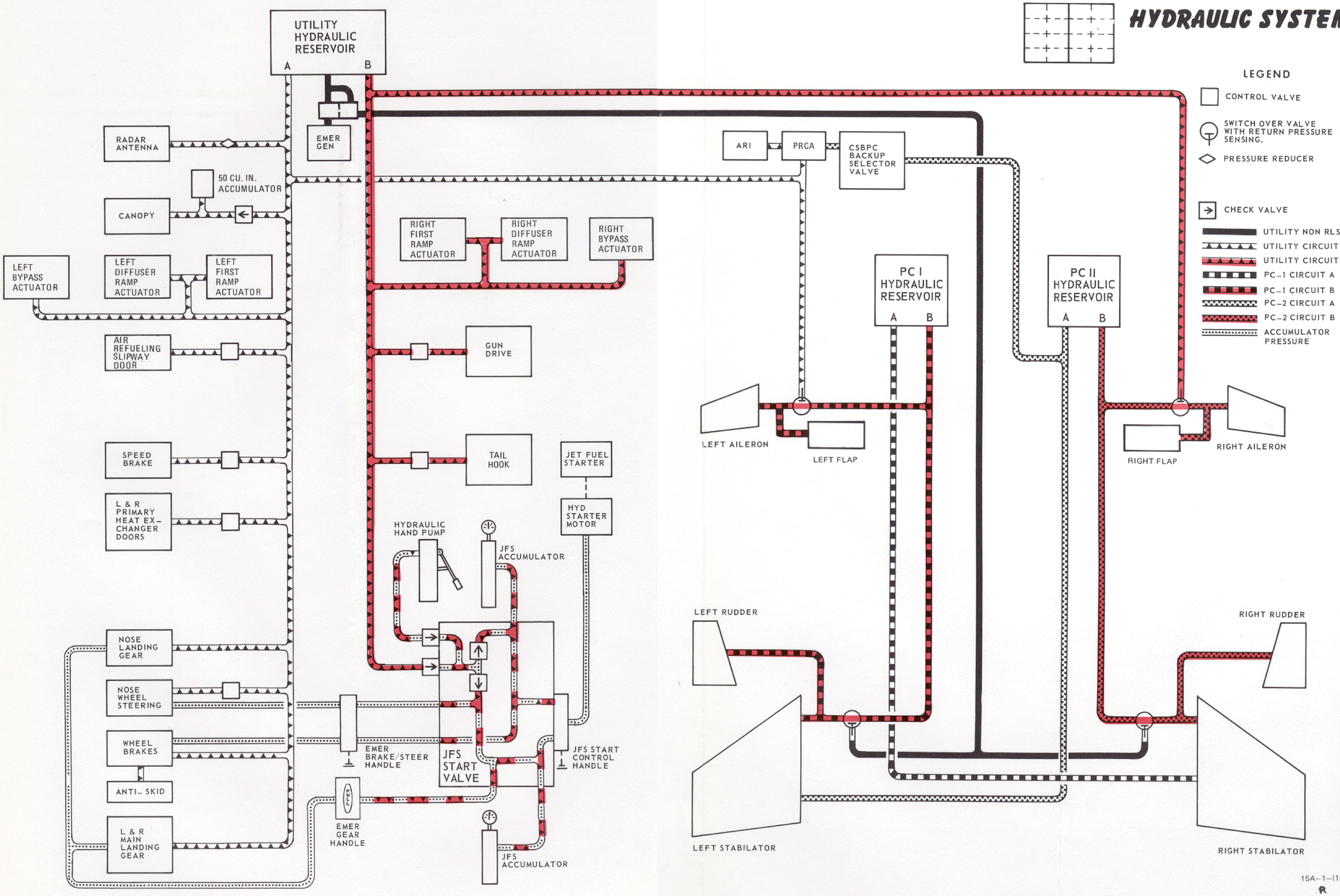
NOTE

NOMENCLATURE CALLOUTS ON THE INDIVIDUAL BUSES ARE CIRCUIT BREAKER NOMENCLATURES. THESE NOMENCLATURES DO NOT NECESSARILY IDENTIFY EACH SYSTEM POWERED BY THE CIRCUIT BREAKERS.

15A–1–1381AC

Figure FO-5

HYDRAULIC SYSTEMS



HYDRAULIC SYSTEMS

Figure FO-6

SAFETY SPRING CARTRIDGE
RIGHT RUDDER PEDAL
LEFT RUDDER PEDAL
RUDDER DIRECTIONAL ARTIFICIAL FEEL AND TRIM ACTUATOR
CONTROL STICK
LONGITUDINAL ARTIFICIAL FEEL AND TRIM ACTUATOR
MASS WEIGHT
AUTO
PITCH
RATIO
EMERG
ROLL RATIO
AUTO
EMERG
LATERAL ARTIFICIAL FEEL AND TRIM ACTUATOR
AILERON RUDDER INTERCONNECT
PITOT STATIC INPUTS
YAW RIGHT
YAW LEFT
CABLE
PITCH/ROLL CHANNEL ASSEMBLY (PRCA)
FEEDBACK
PITCH RATIO SERVO VALVE
AIR DATA SCHEDULER
PITCH RATIO CHANGER ACTUATOR
PITCH RATIO CHANGER LINKAGE
RATIO CHANGER LOCK
LOAD FACTOR ERROR SENSOR
EMERGENCY PRESSURE VALVE (EPV)
BOOST ACTUATOR
PITCH BOOST SERVO CONTROL VALVE
BOOST LINKAGE LOCK
PITCH TRIM COMPENSATOR LOCK
PITCH TRIM COMPENSATOR
CAS INTERCONNECT
CAS INTERCONNECT SERVO LOCK
MODE SELECT CONTROL
ROLL RATIO CHANGER LINKAGE
RATIO CHANGER LOCK
BOOST ACTUATOR
ROLL BOOST SERVO CONTROL VALVE
ROLL RATIO CHANGER ACTUATOR
ROLL RATIO SERVO VALVE
AIR DATA SCHEDULER
BOOST LINKAGE LOCK
FEEDBACK
PITOT STATIC INPUTS
FROM CAS
COMMON PIVOT
LATERAL AND LONGITUDINAL MECHANICAL MIXER ASSEMBLY
RIGHT AILERON ACTUATOR
RIGHT AILERON
ROLL RIGHT
SAFETY SPRING CARTRIDGE
CABLES
ROLL LEFT
ROLL RIGHT
NOSE UP ROLL RIGHT
RIGHT STABILATOR
RIGHT STABILATOR ACTUATOR
NOSE DOWN – ROLL LEFT
NOSE UP – ROLL RIGHT
RIGHT RUDDER
RIGHT RUDDER ROTARY ACTUATOR
STABILATOR RUDDER AND EMERGENCY GENERATOR BACK-UP PRESSURE SELECTOR VALVE
LEFT RUDDER ROTARY ACTUATOR
LEFT RUDDER
NOSE DOWN – ROLL RIGHT
NOSE UP – ROLL LEFT
LEFT STABILATOR ACTUATOR
NOSE DOWN ROLL RIGHT
LEFT STABILATOR
SAFETY SPRING CARTRIDGE
CABLES
ROLL RIGHT
ROLL LEFT
LEFT AILERON ACTUATOR
LEFT AILERON
ROLL RIGHT
LEGEND
UTILITY HYDRAULIC PRESSURE
(NON RLS)
CIRCUIT A (RLS)
CIRCUIT B (RLS)
UTILITY HYDRAULIC RETURN
PC–1 HYDRAULIC PRESSURE
CIRCUIT A
CIRCUIT B
PC–1 HYDRAULIC RETURN
PC–2 HYDRAULIC PRESSURE
CIRCUIT A
CIRCUIT B
PC–2 HYDRAULIC RETURN
ELECTRICAL CONNECTION
MECHANICAL CONNECTION
SWITCHING VALVE
CENTER LOCK
(RLS) RESERVOIR LEVEL SENSING
15A–1–(20)A

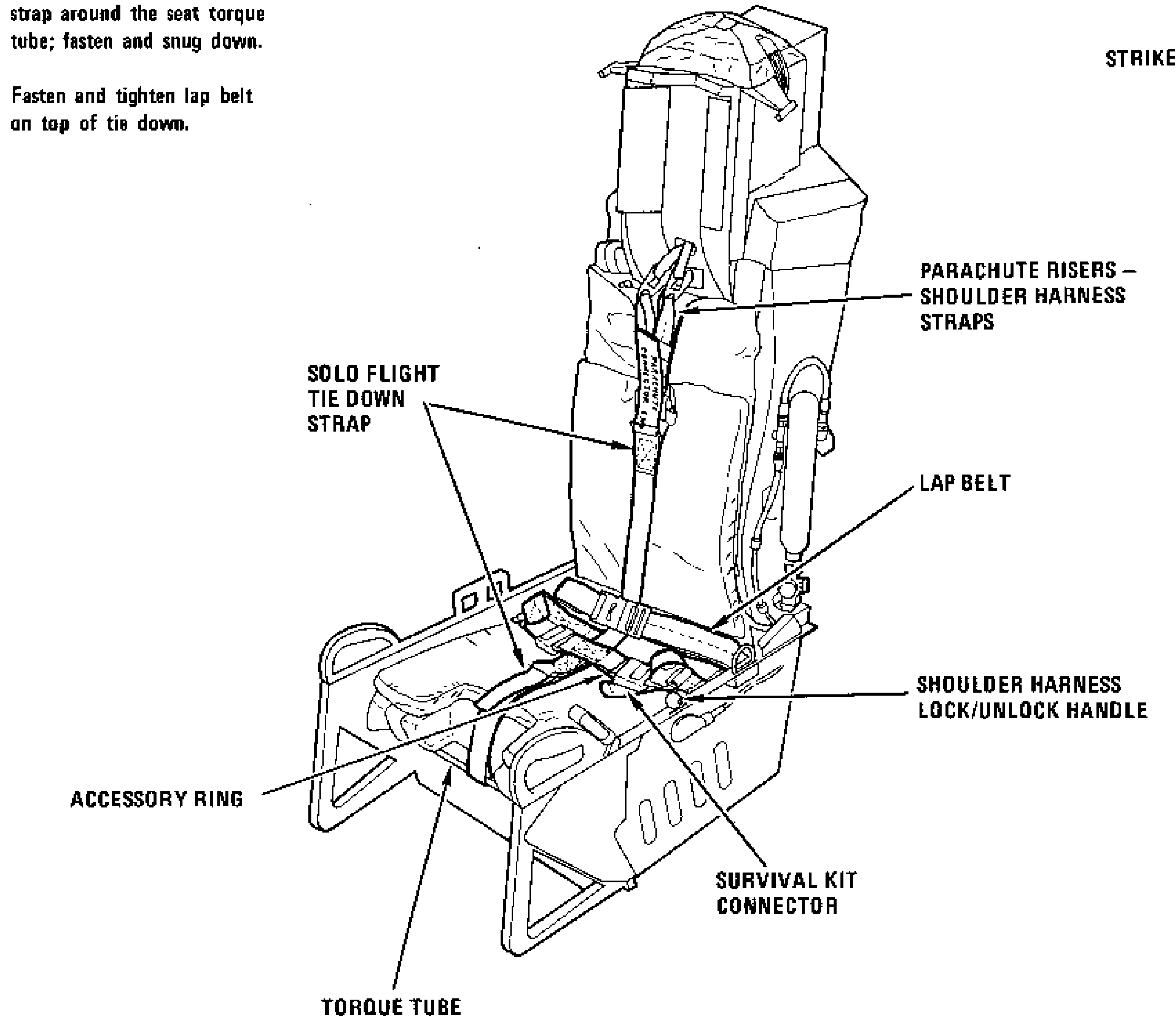
Figure FO-7

EJECTION SEAT

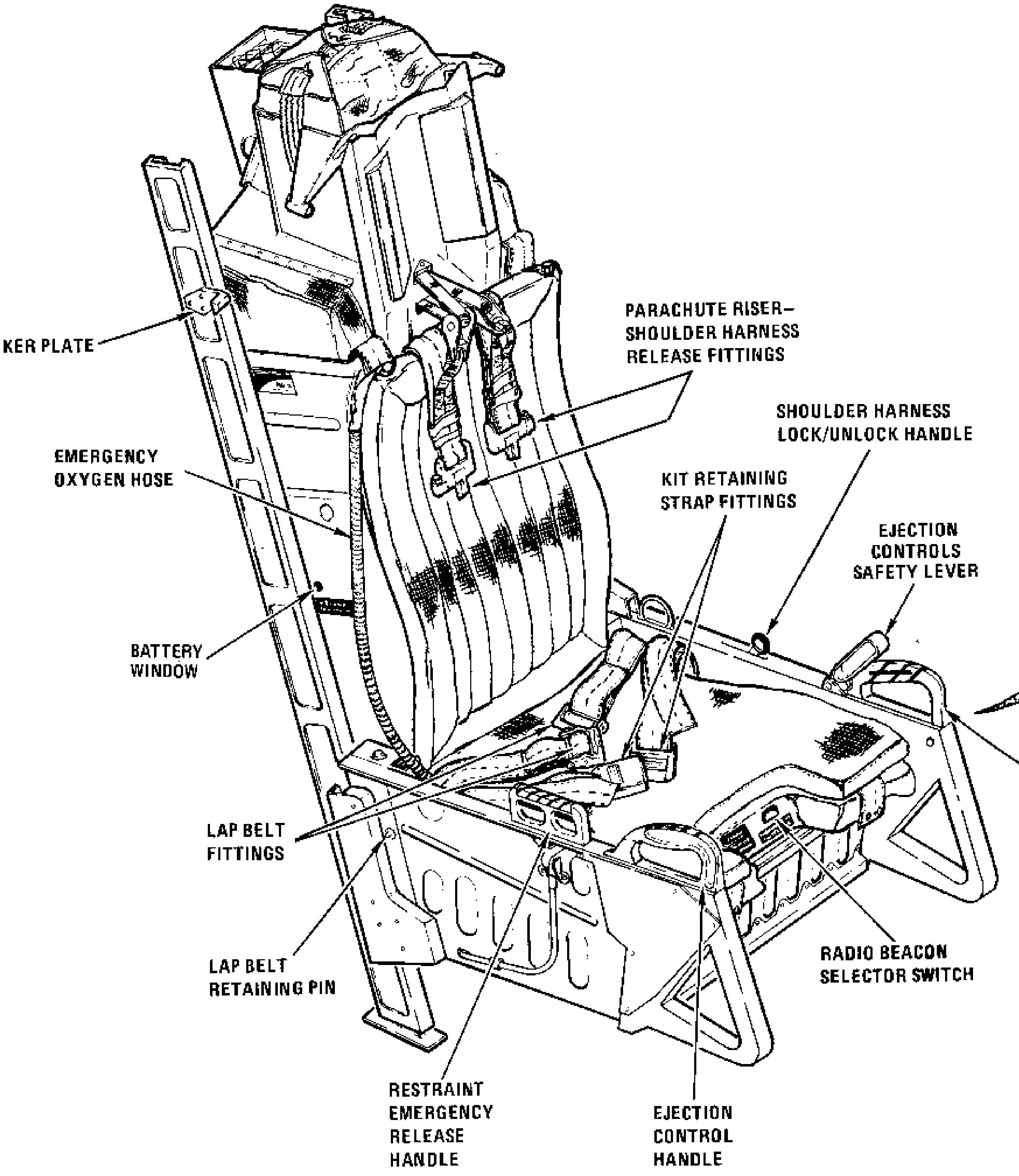
TYPICAL

TIE DOWN PROCEDURE

1. After orienting the strap end labeled **PARACHUTE CONNECTOR END** toward top of seat, attach accessory rings to survival kit; center and tighten straps.
2. Install strap end labeled **PARACHUTE CONNECTOR END** through both parachute/shoulder harness connectors; buckle and fully tighten strap with the shoulder harness lock/unlock handle in forward position.
3. Loop the lower end of the strap around the seat torque tube; fasten and snug down.
4. Fasten and tighten lap belt on top of tie down.

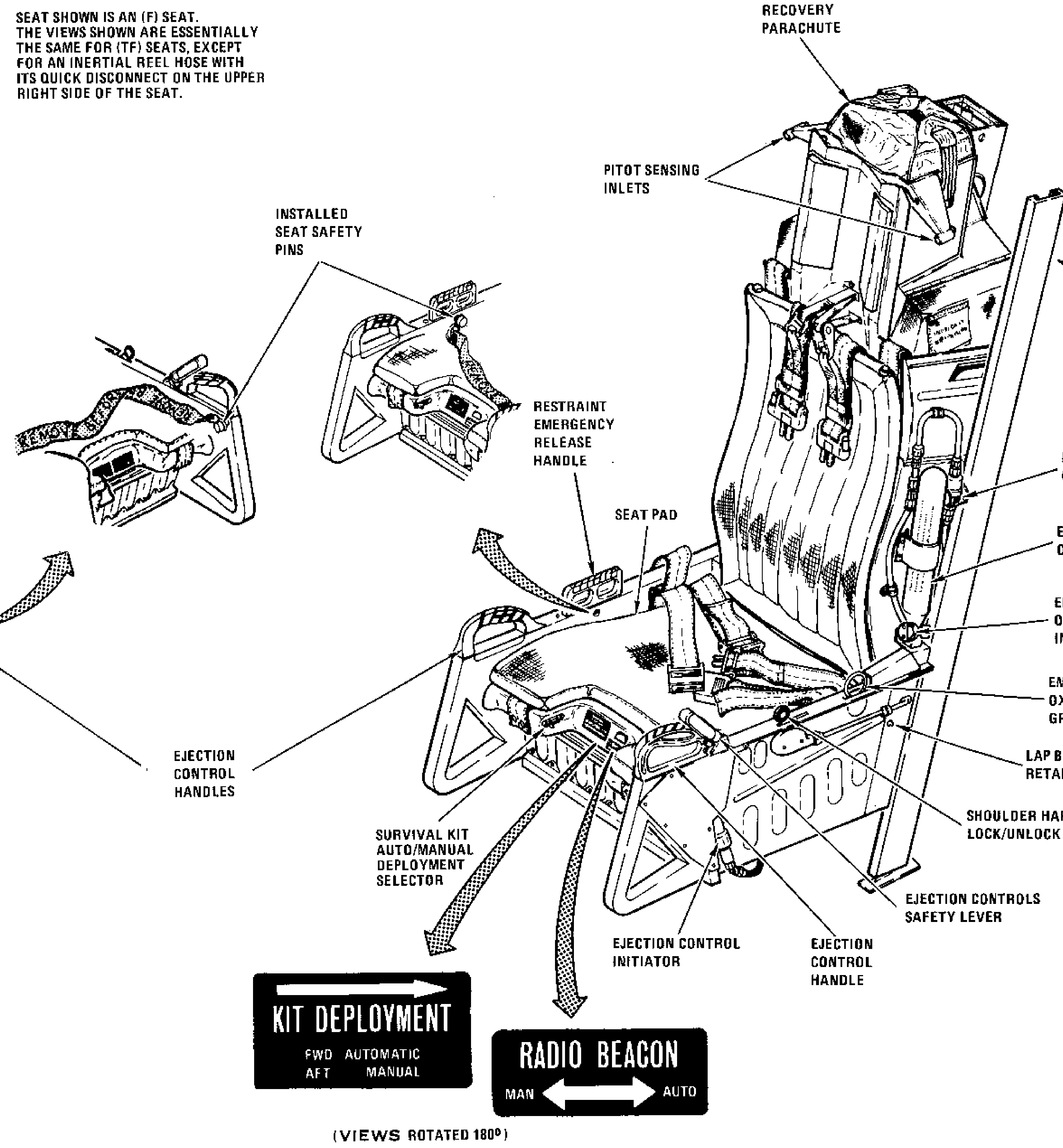

PARACHUTE RISERS – SHOULDER HARNESS STRAPS
SOLO FLIGHT TIE DOWN STRAP
LAP BELT
SHOULDER HARNESS LOCK/UNLOCK HANDLE
ACCESSORY RING
SURVIVAL KIT CONNECTOR
TORQUE TUBE

SOLO FLIGHT TIE DOWN STRAP INSTALLATION

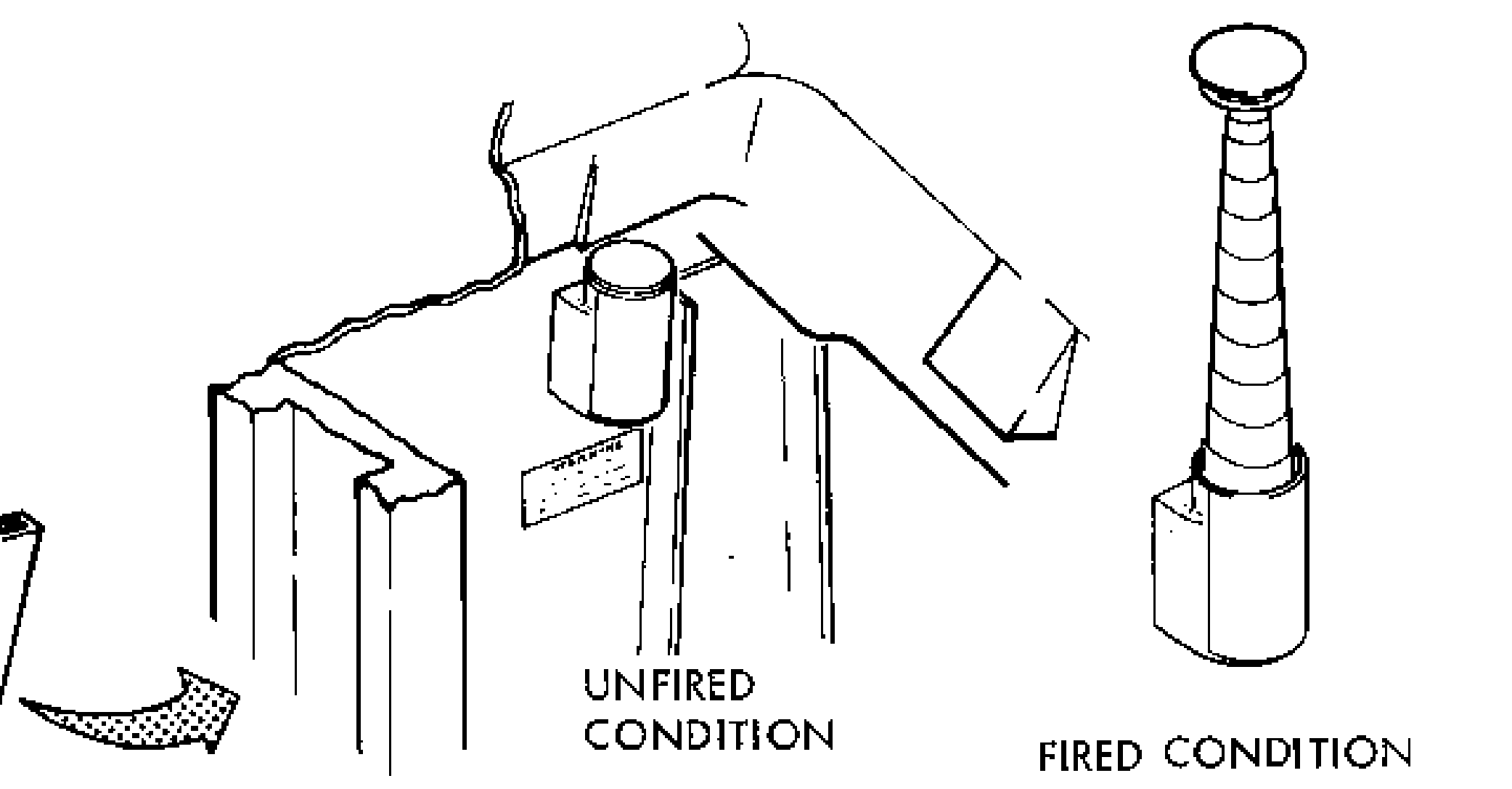

STRIKER PLATE
PARACHUTE RISER–SHOULDER HARNESS RELEASE FITTINGS
EMERGENCY OXYGEN HOSE
SHOULDER HARNESS LOCK/UNLOCK HANDLE
KIT RETAINING STRAP FITTINGS
EJECTION CONTROLS SAFETY LEVER
BATTERY WINDOW
LAP BELT FITTINGS
LAP BELT RETAINING PIN
RADIO BEACON SELECTOR SWITCH
RESTRAINT EMERGENCY RELEASE HANDLE
EJECTION CONTROL HANDLE

NOTE

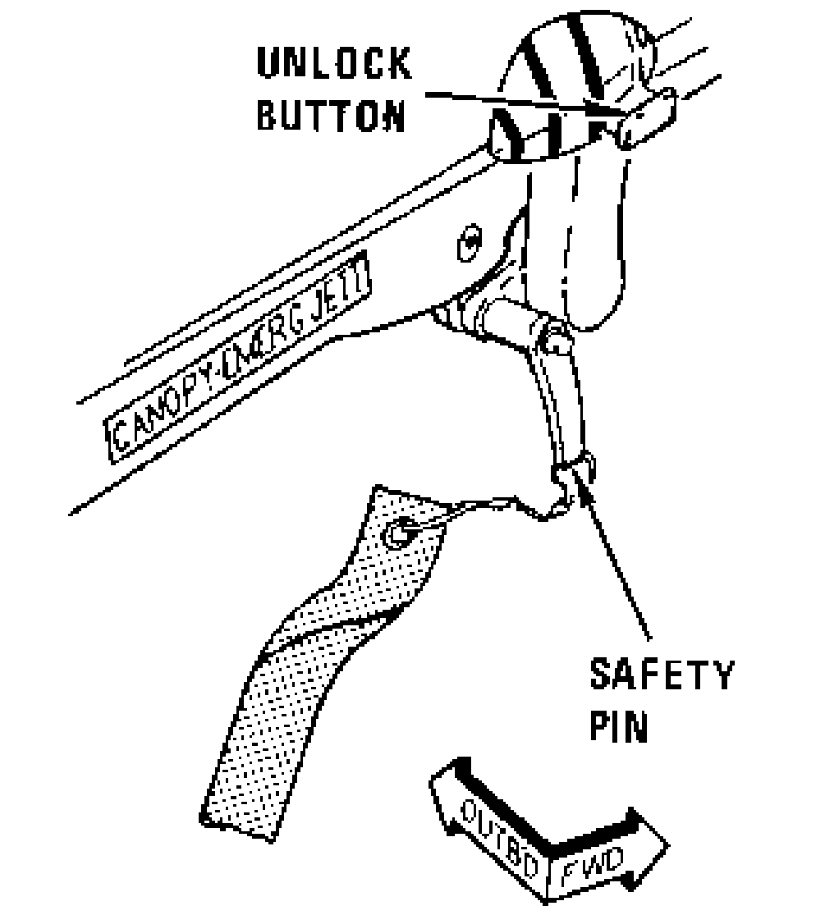
SEAT SHOWN IS AN (F) SEAT. THE VIEWS SHOWN ARE ESSENTIALLY THE SAME FOR (TF) SEATS, EXCEPT FOR AN INERTIAL REEL HOSE WITH ITS QUICK DISCONNECT ON THE UPPER RIGHT SIDE OF THE SEAT.


RECOVERY PARACHUTE
PITOT SENSING INLETS
INSTALLED SEAT SAFETY PINS
RESTRAINT EMERGENCY RELEASE HANDLE
SEAT PAD
EJECTION HOSE QUICK DISCONNECT
EMERGENCY OXYGEN BOTTLE
EMERGENCY OXYGEN INDICATOR
EMERGENCY OXYGEN GREEN RING
EJECTION CONTROL HANDLES
LAP BELT RETAINING PIN
SHOULDER HARNESS LOCK/UNLOCK HANDLE
SURVIVAL KIT AUTO/MANUAL DEPLOYMENT SELECTOR
EJECTION CONTROLS SAFETY LEVER
EJECTION CONTROL INITIATOR
EJECTION CONTROL HANDLE
KIT DEPLOYMENT
FWD AUTOMATIC
AFT MANUAL
RADIO BEACON
MAN
AUTO

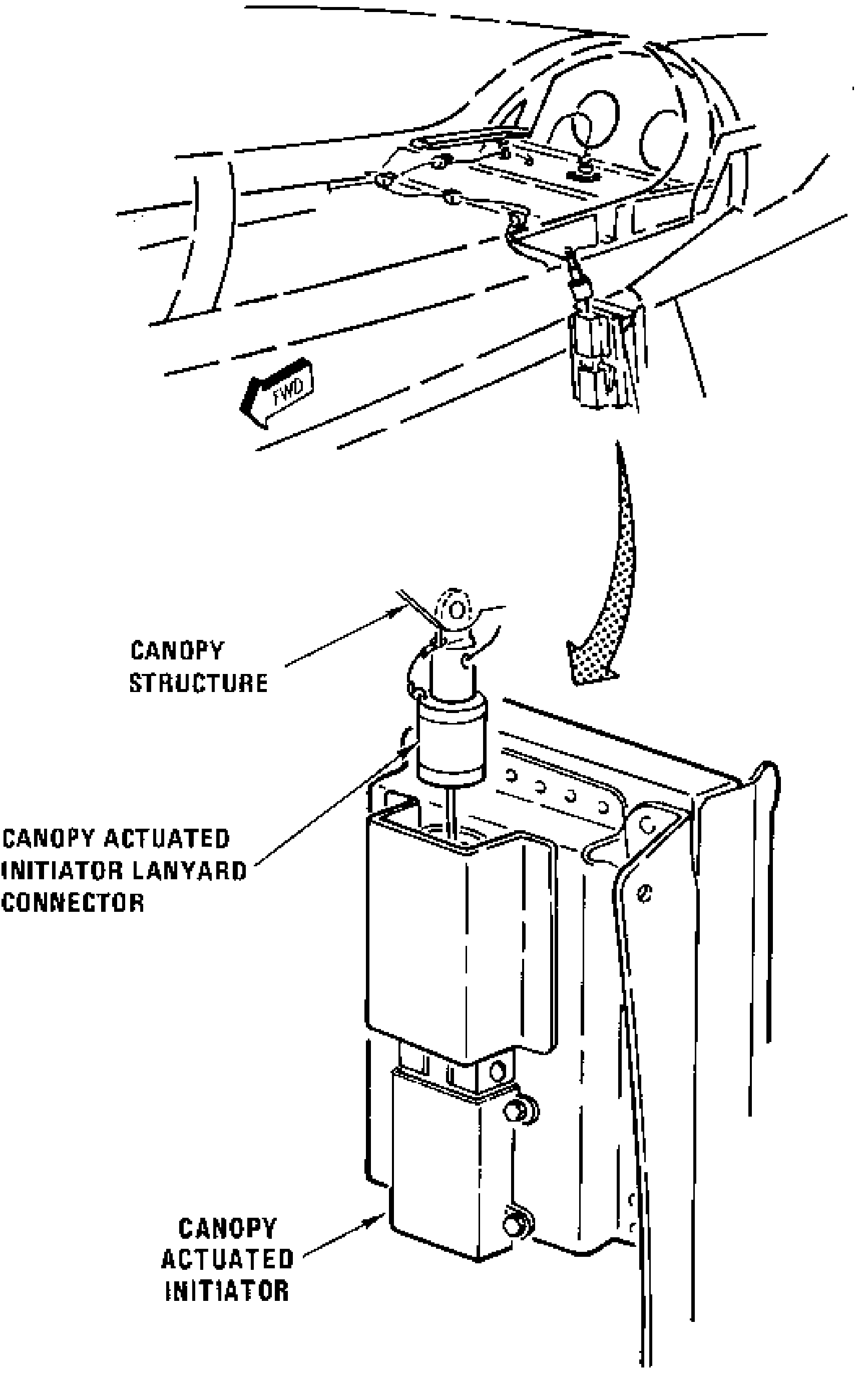
(VIEWS ROTATED 180°)



CANOPY ACTUATED INITIATOR FIRING INDICATOR



CANOPY JETTISON HANDLE


FWD
CANOPY STRUCTURE
CANOPY ACTUATED INITIATOR LANYARD CONNECTOR
CANOPY ACTUATED INITIATOR

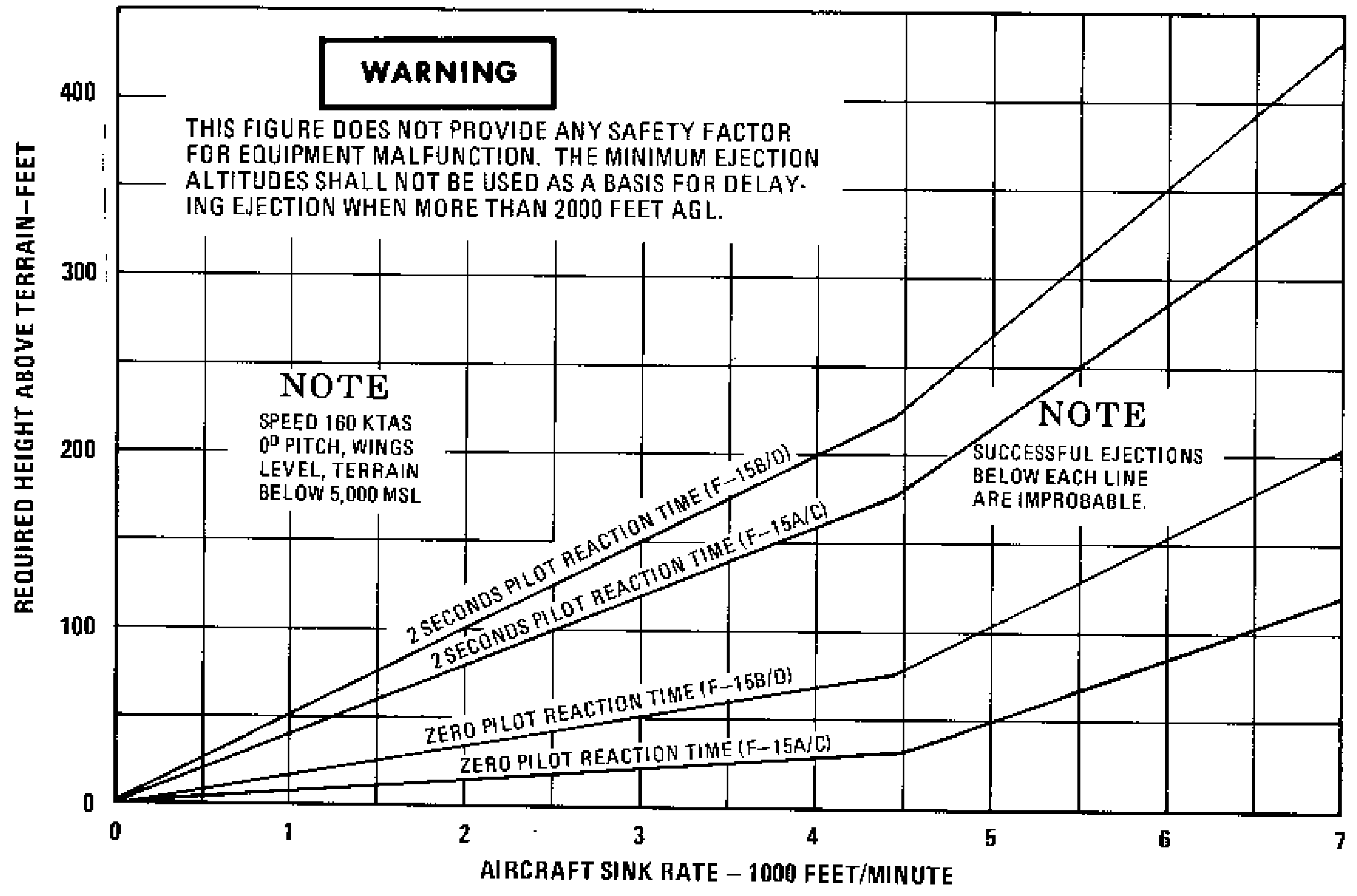
15A-1-(126)F

Figure FO-8

EJECTION SEAT PERFORMANCE CHARTS

MINIMUM EJECTION ALTITUDE VS. SINK RATE

F-15A/C AND F-15B/D EJECTION SEATS



WARNING

THIS FIGURE DOES NOT PROVIDE ANY SAFETY FACTOR FOR EQUIPMENT MALFUNCTION. THE MINIMUM EJECTION ALTITUDES SHALL NOT BE USED AS A BASIS FOR DELAYING EJECTION WHEN MORE THAN 2000 FEET AGL.

NOTE

SPEED 160 KTAS
0° PITCH, WINGS LEVEL, TERRAIN BELOW 5,000 MSL

NOTE

SUCCESSFUL EJECTIONS BELOW EACH LINE ARE IMPROBABLE.

MINIMUM EJECTION ALTITUDE FOR SELECTED FLIGHT CONDITIONS

FLIGHT CONDITIONS	F–15A/C MINIMUM EJECTION ALT (FEET)	F–15B/D MINIMUM EJECTION ALT (FEET)
ZERO SPEED, ZERO ALTITUDE – (CANOPY MUST BE CLOSED AND LOCKED OR COMPLETELY SEPARATED)	0	0
120 KNOTS, 0° PITCH, 60° BANK ◁1	0	0 ◁2
600 KNOTS, 0° PITCH, 0° BANK	0	0
150 KNOTS, 0° PITCH, 180° BANK	280	280
150 KNOTS, 0° PITCH, 0° BANK, 10,000 FPM SINK RATE	240	360
200 KNOTS, -60° PITCH, 0° BANK	600	810
450 KNOTS, -30° PITCH, 0° BANK	570	880
200 KNOTS, -60° PITCH, 60° BANK	650	860 ◁2
250 KNOTS, -45° PITCH, 180° BANK	780	1000

1▷ FOR THIS CASE, IMPACT OCCURS AT THE INSTANT OF SEAT/AIRCRAFT SEPARATION. IN ALL OTHER CASES, CONDITIONS ARE AT SYSTEM INITIATION.

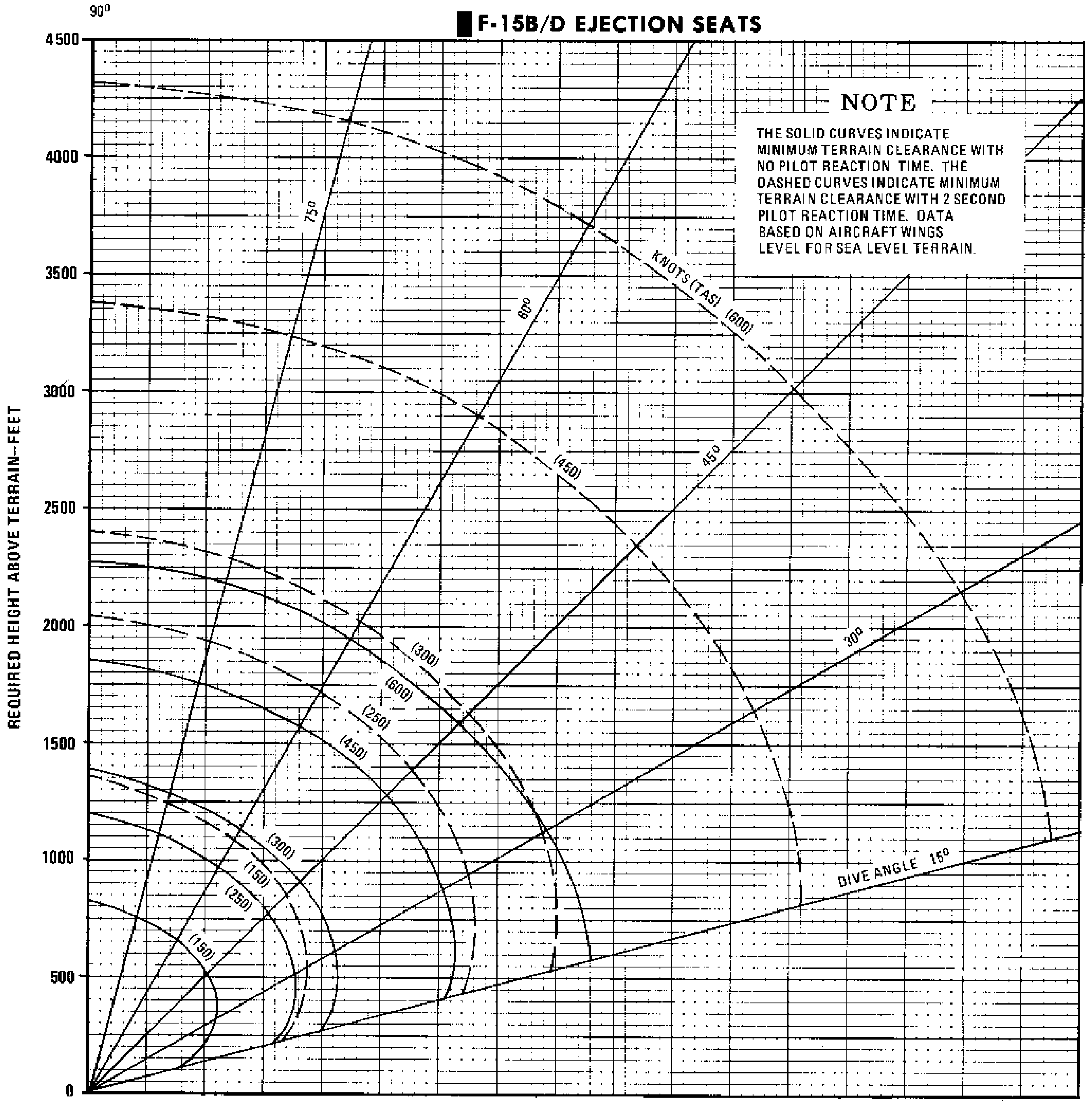
2▷ FOR THESE CASES, RECOVERY PERFORMANCE IS BASED ON THE MOST CRITICAL (FRONT SEAT) ROLL/SEAT TRAJECTORY COMBINATION.

WARNING

THE FIGURE DOES NOT PROVIDE ANY SAFETY FACTOR FOR EQUIPMENT MALFUNCTION OR PILOT REACTION TIME. THE ABOVE MINIMUM EJECTION ALTITUDES SHALL NOT BE USED AS THE BASIS FOR DELAYING EJECTION MORE THAN 2000 FEET AGL.

MINIMUM EJECTION ALTITUDE VS. AIRSPEED AND DIVE ANGLE

F-15B/D EJECTION SEATS



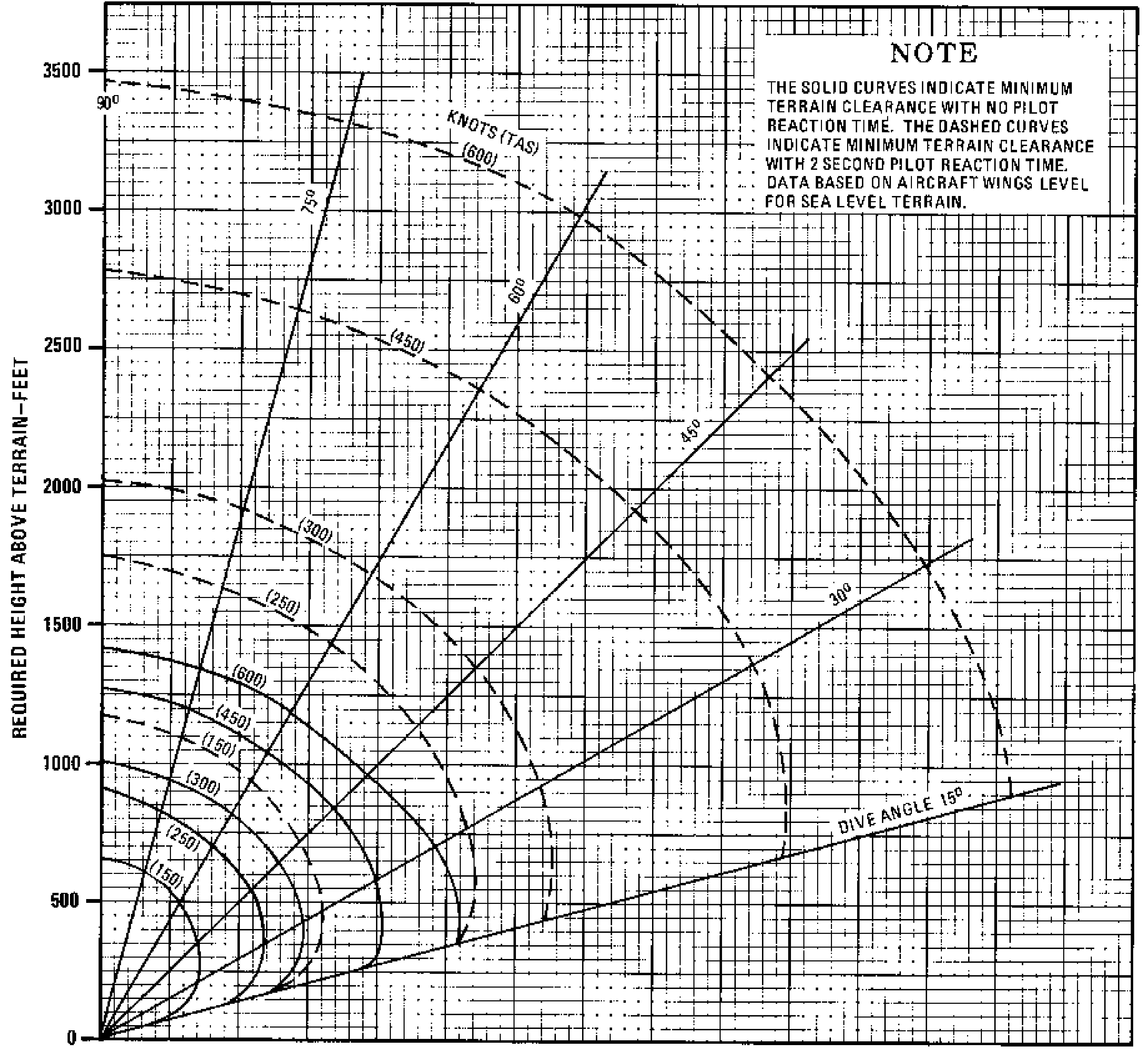
NOTE

THE SOLID CURVES INDICATE MINIMUM TERRAIN CLEARANCE WITH NO PILOT REACTION TIME. THE DASHED CURVES INDICATE MINIMUM TERRAIN CLEARANCE WITH 2 SECOND PILOT REACTION TIME. DATA BASED ON AIRCRAFT WINGS LEVEL FOR SEA LEVEL TERRAIN.

WARNING

THE FIGURE DOES NOT PROVIDE ANY SAFETY FACTOR FOR EQUIPMENT MALFUNCTION. THE ABOVE MINIMUM EJECTION ALTITUDES SHALL NOT BE USED AS THE BASIS FOR DELAYING EJECTION WHEN MORE THAN 2000 FEET AGL.

F-15A/C EJECTION SEAT



NOTE

THE SOLID CURVES INDICATE MINIMUM TERRAIN CLEARANCE WITH NO PILOT REACTION TIME. THE DASHED CURVES INDICATE MINIMUM TERRAIN CLEARANCE WITH 2 SECOND PILOT REACTION TIME. DATA BASED ON AIRCRAFT WINGS LEVEL FOR SEA LEVEL TERRAIN.

WARNING

THE FIGURE DOES NOT PROVIDE ANY SAFETY FACTOR FOR EQUIPMENT MALFUNCTION. THE ABOVE MINIMUM EJECTION ALTITUDES SHALL NOT BE USED AS THE BASIS FOR DELAYING EJECTION WHEN MORE THAN 2000 FEET AGL.

15A–1–(132)B

Figure FO-9

ENVIRONMENTAL CONTROL SYSTEM

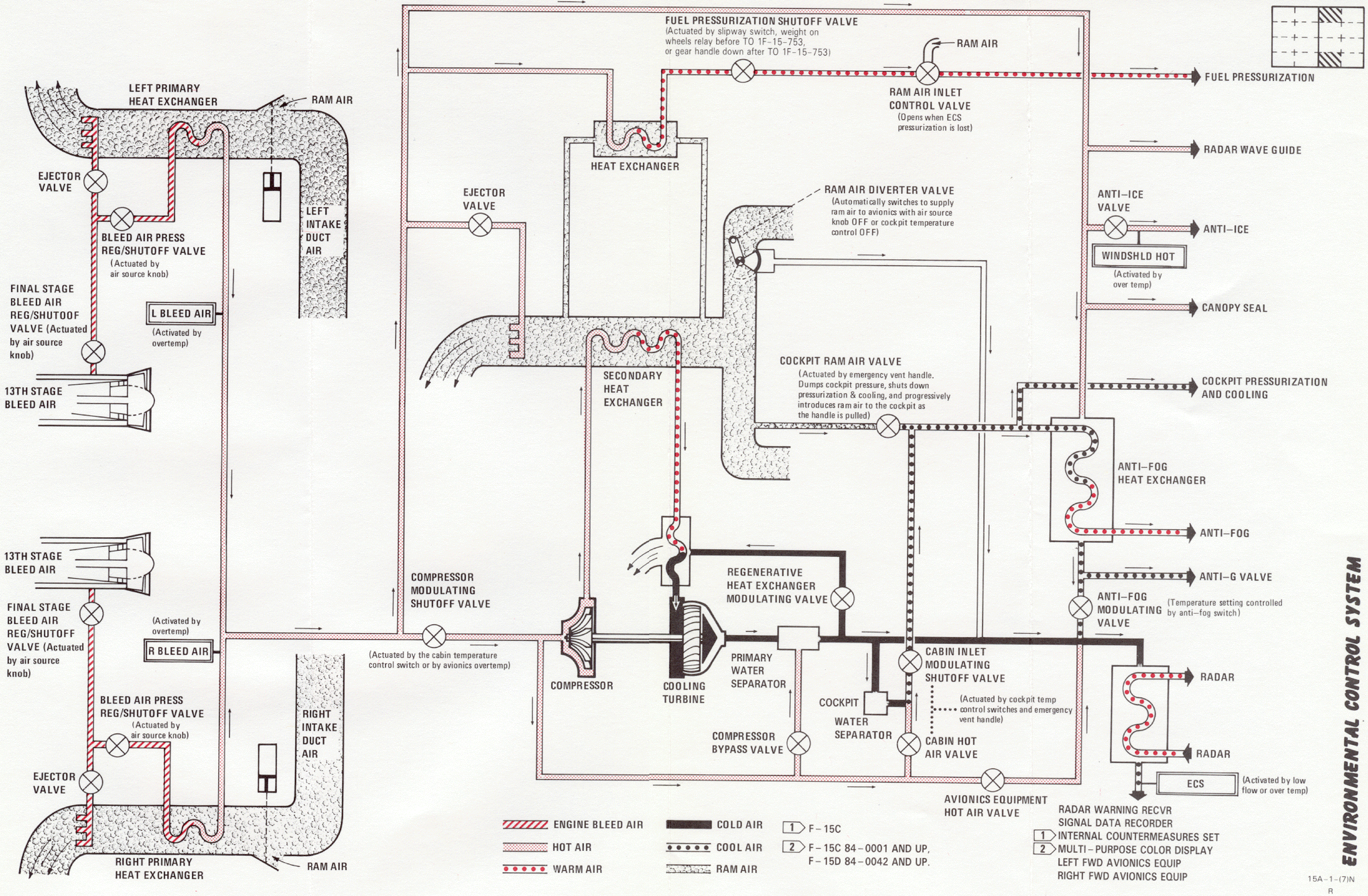

FUEL PRESSURIZATION SHUTOFF VALVE
(Actuated by slipway switch, weight on wheels relay before TO 1F-15-753, or gear handle down after TO 1F-15-753)
RAM AIR
FUEL PRESSURIZATION
RAM AIR INLET CONTROL VALVE
(Opens when ECS pressurization is lost)
LEFT PRIMARY HEAT EXCHANGER
RAM AIR
HEAT EXCHANGER
RADAR WAVE GUIDE
EJECTOR VALVE
LEFT INTAKE DUCT AIR
EJECTOR VALVE
RAM AIR DIVERTER VALVE
(Automatically switches to supply ram air to avionics with air source knob OFF or cockpit temperature control OFF)
ANTI-ICE VALVE
ANTI-ICE
BLEED AIR PRESS REG/SHUTOFF VALVE
(Actuated by air source knob)
WINDSHLD HOT
(Activated by over temp)
FINAL STAGE BLEED AIR REG/SHUTOOF VALVE (Actuated by air source knob)
L BLEED AIR
(Activated by overtemp)
CANOPY SEAL
COCKPIT RAM AIR VALVE
(Actuated by emergency vent handle. Dumps cockpit pressure, shuts down pressurization & cooling, and progressively introduces ram air to the cockpit as the handle is pulled)
13TH STAGE BLEED AIR
SECONDARY HEAT EXCHANGER
COCKPIT PRESSURIZATION AND COOLING
ANTI-FOG HEAT EXCHANGER
ANTI-FOG
13TH STAGE BLEED AIR
REGENERATIVE HEAT EXCHANGER MODULATING VALVE
ANTI-G VALVE
COMPRESSOR MODULATING SHUTOFF VALVE
ANTI-FOG MODULATING VALVE
(Temperature setting controlled by anti-fog switch)
FINAL STAGE BLEED AIR REG/SHUTOFF VALVE (Actuated by air source knob)
(Activated by overtemp)
R BLEED AIR
(Actuated by the cabin temperature control switch or by avionics overtemp)
CABIN INLET MODULATING SHUTOFF VALVE
PRIMARY WATER SEPARATOR
RADAR
COMPRESSOR
COOLING TURBINE
(Actuated by cockpit temp control switches and emergency vent handle)
COCKPIT WATER SEPARATOR
BLEED AIR PRESS REG/SHUTOFF VALVE
(Actuated by air source knob)
RIGHT INTAKE DUCT AIR
COMPRESSOR BYPASS VALVE
CABIN HOT AIR VALVE
RADAR
EJECTOR VALVE
ECS
(Activated by low flow or over temp)
AVIONICS EQUIPMENT HOT AIR VALVE
RADAR WARNING RECVR
SIGNAL DATA RECORDER
1 INTERNAL COUNTERMEASURES SET
2 MULTI-PURPOSE COLOR DISPLAY
LEFT FWD AVIONICS EQUIP
RIGHT FWD AVIONICS EQUIP
RIGHT PRIMARY HEAT EXCHANGER
RAM AIR
ENGINE BLEED AIR
HOT AIR
WARM AIR
COLD AIR
COOL AIR
RAM AIR
1 F-15C
2 F-15C 84-0001 AND UP, F-15D 84-0042 AND UP.
ENVIRONMENTAL CONTROL SYSTEM
15A-1-(7)N
R

Figure FO-10

GLOSSARY

A

A/A - Air-to-air

AAI - Air-to-air interrogator

AB - Afterburner

AC - Alternating current

ACS - Armament control system

A/D - Air data

ADC - Air data computer

ADF - Automatic direction finding

ADI - Attitude director indicator

AFCS - Automatic flight control system

A/G - Air-to-ground

AHRS - Attitude heading reference system

AIC - Air inlet controller

AIM - Air intercept missile

ALTMTR - Altimeter

AMAD - Airframe mounted accessory drive

AMI - Airspeed Mach indicator

AOA - Angle-of-attack

ARI - Aileron rudder interconnect

ASP - Avionics status panel

AUX - Auxiliary

B

BATH - Best available true heading

BCN - Beacon

BCP - Bit control panel

BINGO - Return to this channel (radio). Return fuel state

BIT - Built-in-test

BST PMP - Boost pump

C

CC - Central computer

CCC - Central computer complex

CCW - Counterclockwise

CAS - Control augmentation system. Calibrated airspeed

CG - Center of gravity

CGB - Central gearbox

CIVV - Compressor inlet variable vanes

CMD - Countermeasures dispenser

COMM - Communication(s)

CSBPC - Control stick boost/pitch compensator

CSD - Constant speed drive

CSS - Control stick steering

CTR - Centerline tank. Center

CW - Clockwise

D

DART - Directional automatic realignment of trajectory

DC - Direct current

DEEC - Digital electronic engine control

DG - Directional gyro

DRD - Data readout display

E

EAS - Equivalent airspeed

ECCM - Electronic counter-countermeasures

ECM - Electronic countermeasures

ECS - Environmental control system

EDU - Engine diagnostic unit

EEC - Engine electronic control

EPR - Engine pressure ratio

EWW - Electronic warfare warning

EXCDNCE CNTR - Exceedance counter

EXT - External

F

FF - Fuel flow, Free fall

FPM - Feet per minute

FTIT - Fan turbine inlet temperature

G

g - Unit of acceleration of gravity

GCA - Ground control approach

GPM - Gallons per minute

H

HSI - Horizontal situation indicator

HUD - Head-up display

HYD - Hydraulic

HZ - Hertz

I

IAS - Indicated airspeed

IBS - Interference blanker set

ICS - Internal countermeasures set, Intercommunication system

IDG - Integrated drive generator

IFF - Identification friend or foe

ILS - Instrument landing system

IMU - Inertial measuring unit

INS - Inertial navigation system

I/P - Identification of position

J

JFS - Jet fuel starter

K

KT - Knot(s)

L

LCG - Lead computing gyroscope

LDG GR - Landing gear

LE - Leading edge

LOX - Liquid oxygen

LRS - Long range search

M

MAC - Mean aerodynamic center

MAX - Maximum

MIL - Military

MHz - Megahertz

MPCD - Multi-purpose color display

MRM - Medium range missile

MSIP - Multi-staged improvement program

M/V - Magnetic variation

N

NCI - Navigation control indicator

NCTR - Non cooperative target recognition

NM - Nautical mile(s)

NOZ POS - Nozzle position indicator

N_1 - Fan speed

N_2 - High compressor speed

O

OAT - Outside air temperature

OMNI - Omnidirectional range (VOR)

ORIDE - Override

O/S - Offset

OWS - Overload warning system

P

PACS - Programmable armament control set

PC - Power control

PC1, PC2 - Power control hydraulic system

PMG - Permanent magnet generator

PP - Present position

PPH - Pounds per hour

PPM - Pounds per minute

PRESS - Pressure

PRCA - Pitch/roll channel assembly

PRF - Pulse repetition frequency

PSI - Pounds per square inch

PTC - Pitch trim compensator

Q

Q - Dynamic or impact pressure

QTY - Quantity

R

RADAR - Radio detection and ranging

RCVV - Rear compressor variable vanes

RLS - Reservoir level sensing

RPM - Revolutions per minute

R/T - Receiver transmitter

RWR - Radar warning receiver

S

SAI - Standby attitude indicator

SDR - Signal data recorder

SIF - Selective identification feature

SOL - Solenoid

SPD BK - Speed brake

SRM - Short range missile

SRS - Short range search

SRU - Shop replaceable unit

STA/JETT - Station jettison

STBY - Standby

STBY ATTD - Standby attitude indicator

T

TAS - True airspeed

TCN - TACAN. Tactical air navigation

TDC - Target designator control

TE - Trailing edge

TEWS - Tactical electronic warfare system

T/O - Takeoff

TR - Transformer Rectifier(s)

TRANS - Transfer

U

UC - Unified control

UHF - Ultra high frequency

UTL - Utility hydraulic system

V

VAC - Volts alternating current

VDC - Volts direct current

VHF - Very high frequency

VI - Visual identification

V_{max} - Maximum speed

VS - Velocity search

VSD - Vertical situation display

VSI - Vertical speed indicator

VORTAC - Very high frequency - omni range and tactical air navigation

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